

**ANALYSIS SUPPORTING AN EIGHT-HOUR
OZONE BOUNDARY OPTION
FOR THE MARICOPA COUNTY NONATTAINMENT AREA**

JULY 2003



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ANALYSIS SUPPORTING AN EIGHT-HOUR OZONE BOUNDARY OPTION FOR THE MARICOPA COUNTY NONATTAINMENT AREA

EXECUTIVE SUMMARY

In July 1997, the Environmental Protection Agency (EPA) promulgated an eight-hour ozone standard of 0.08 parts per million (ppm). In March 2000, EPA requested that States recommend nonattainment area boundaries for the eight-hour standard by June 30, 2000. Following the resolution of legal challenges on the eight-hour ozone standard, EPA set July 15, 2003 as the new deadline for States to recommend eight-hour ozone nonattainment area boundaries.

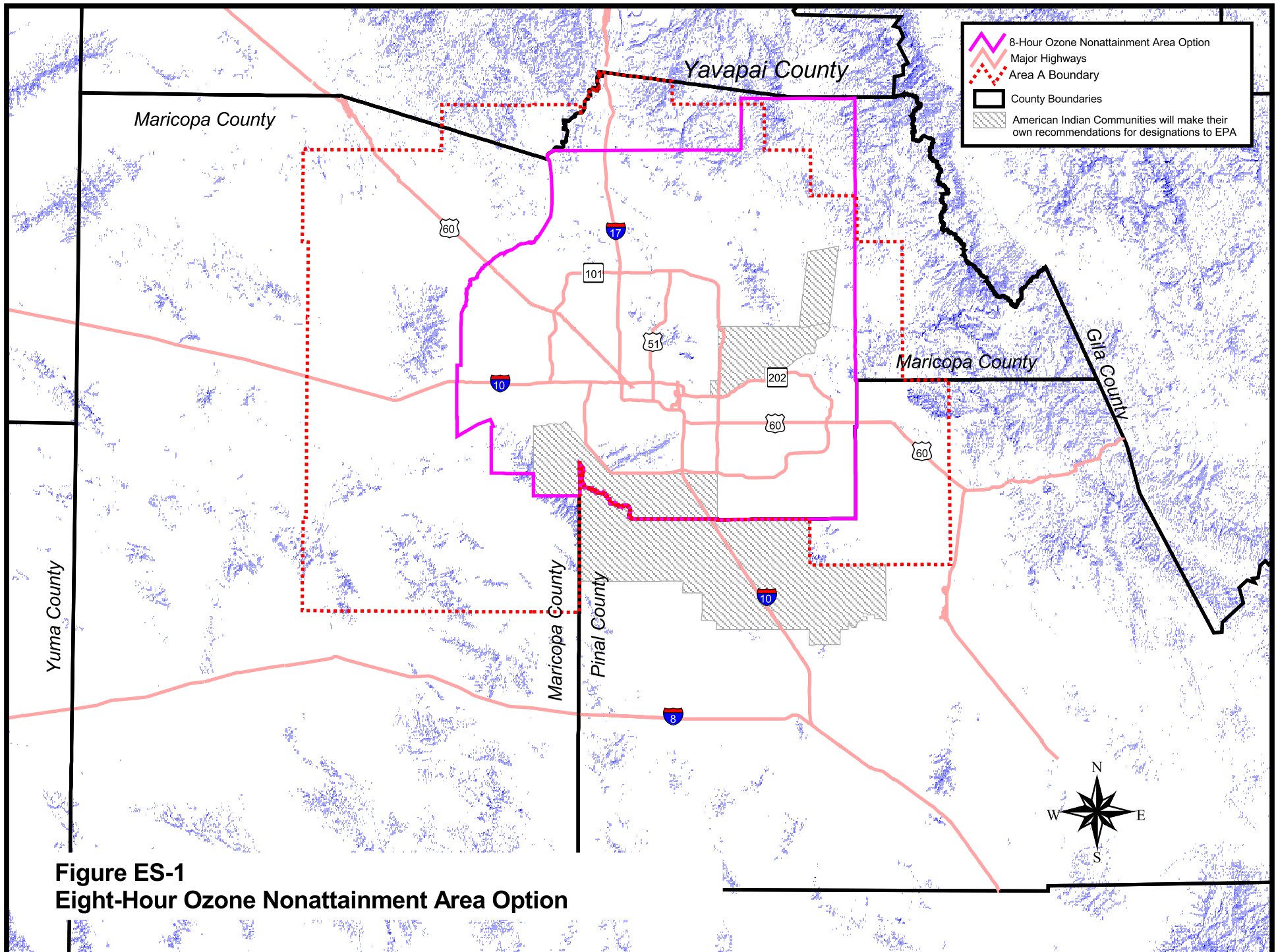
An analysis has been conducted based on EPA guidance to address eleven factors that may affect the drawing of the boundaries for the new eight-hour ozone standard. This analysis concludes that most appropriate boundary for the new eight-hour ozone nonattainment area is the option shown in Figure ES-1. A detailed map and legal description is included in the Appendix. All of the violations of the eight-hour ozone standard and most of the anthropogenic activity causing the formation of ozone in the Phoenix-Mesa Metropolitan Statistical Area (MSA) occurs, and will continue to occur, within the eight-hour ozone boundary option.

The EPA presumption is that nonattainment boundaries reflect the Metropolitan Statistical Area due to the nature of population density, traffic and commuting patterns, commercial development, area growth, and air emissions characteristics of an MSA. However, EPA allows States to recommend nonattainment area boundaries other than the MSA boundary. The Phoenix-Mesa MSA includes all of Maricopa and Pinal Counties, an area of approximately 14,600 square miles. This area is larger than the multi-state area that includes Massachusetts, Connecticut and Rhode Island.

A portion of Maricopa County is currently designated as a nonattainment area for the one-hour ozone standard. The one-hour ozone nonattainment area encompasses 1,946 square miles in the central part of Maricopa County (see Figure ES-1). The eight-hour ozone boundary option is 2,289 square miles, an area larger than the state of Delaware.

It is important to note that the designation of the Indian Communities is under the jurisdiction of the Environmental Protection Agency (EPA) and this report does not address the designation of the Indian Communities. The American Indian Communities shown in Figure ES-1 will make their own recommendations for designations to EPA.

According to EPA guidance, a State wishing to propose a smaller boundary than the Metropolitan Statistical Area should address how each of the following factors affect the drawing of the boundaries: emissions and air quality in adjacent areas; population density and degree of urbanization including commercial development; monitoring data representing ozone concentrations in local areas and larger areas; location of emission sources; traffic and commuting patterns; expected growth; meteorology; geography and topography; jurisdictional boundaries; level of control of emission sources; and regional emission reductions. An analysis has been conducted to address each of these pertinent factors. In addition, EPA guidance requires consideration of how the resulting boundary recommendation is consistent with the definition of nonattainment in the Clean Air Act, Section 107(d)(1). The results of the analysis are summarized below.



- **Expected Growth** - More than 6 million people and nearly 3 million jobs are expected to be located inside the Phoenix-Mesa Metropolitan Statistical Area (MSA) by 2020. Between 2000 and 2020, 65 percent of the population growth and 81 percent of the employment growth in the MSA will occur inside the proposed boundary option. The expected growth in population and employment does not equate to future increases in emissions or ozone concentrations. In fact, past trends and future projections indicate that ozone precursor emissions will continue to decline, in spite of rapid growth in the area, due to local controls already in place in Area A and stricter federally-mandated standards for vehicles and fuels that will go into effect beginning next year.
- **Air Quality** - Violations of the eight-hour standard occurred at only three out of nineteen monitors in the MSA, based on 2000-2002 data. These three monitors, located in north central and northeastern Maricopa County, recorded violations only slightly higher than the standard (.085 ppm). The three ozone monitors in Pinal County have not violated the eight-hour standard.
- **Emissions** - At least 93 percent of the volatile organic compounds (VOC) and 85 percent of the nitrogen oxides (NOx) produced by humans will remain within the boundary option through 2015.
- **Population Density and Degree of Urbanization** - More than three-quarters of the densest residential areas and 94 percent of the highest employment areas in the Metropolitan Statistical Area will remain inside the boundary option by 2020.
- **Monitoring Data in Local and Larger Areas** - Only three monitors in the Phoenix-Mesa MSA violated the eight-hour ozone standard based on the most recent three years of data (2000-2002). The violations recorded by these monitors are only .001 ppm above the standard (at .085 ppm). All three of the violating monitors are located inside the boundary option. Rural monitors outside the boundary that have readings approaching the standard are located at least thirty miles from the Urban Planning Area and may be influenced by other sources such as biogenics.
- **Location of Emission Sources** - At least 85 percent of the anthropogenic emissions and most of the major point sources will continue to be located inside the boundary option through 2015. By 2015, some new power plants will locate outside the boundary option in western Maricopa County.
- **Traffic and Commuting Patterns** - Traffic forecasts based on the latest socioeconomic projections show that most of the future freeway congestion and commute trips will continue to take place inside the boundary option.
- **Meteorology, Geography and Topography** - The wind flow patterns in the Valley play a significant role in the formation and movement of ozone pollution. The mountains to the north and east of the urban area serve as a natural barrier that inhibits transport of emissions away from the Valley.
- **Jurisdictional Boundaries** - Pinal County has not had violations of the eight-hour ozone standard and does not contribute to violations in Maricopa County, and therefore, should not be included in the nonattainment boundary.
- **Level of Control of Emission Sources** - Control measures applied in the one-hour ozone nonattainment area, Maricopa County, and Area A have been successful in eliminating exceedances of the one-hour ozone standard in the MSA since 1996. Existing controls and other measures which may be mandated within the boundary option and Area A will be effective in eliminating eight-hour ozone violations throughout the MSA. EPA has adopted stricter Tier 2 light duty vehicle and heavy duty vehicle controls and low sulfur fuels which

will significantly reduce vehicle emissions in the near future. EPA guidance issued June 2, 2003 indicates that these federal measures alone may be sufficient to achieve attainment of the eight-hour standard by 2007 in areas with ozone concentrations close to the level of the standard (e.g. .005), such as the Phoenix-Mesa Metropolitan Statistical Area.

- **Regional Emission Reductions** - Modeling for the one-hour ozone nonattainment area in Maricopa County shows that onroad mobile source emissions of VOCs and NO_x will be reduced by more than 55 percent between 1999 and 2015, at the same time vehicle travel is projected to increase by 65 percent. These reductions will occur as a result of local control measures already in place, as well as stricter federal standards for light duty vehicles, heavy duty vehicles and engines, and low sulfur fuels. EPA guidance issued June 2, 2003 indicates that areas such as Maricopa County that are close to the eight-hour ozone standard are likely to attain the standard by 2007 due to federally-mandated vehicle and fuel controls alone.
- **Consistency with the Clean Air Act** - The eight-hour ozone boundary option is consistent with the definition of nonattainment in the Clean Air Act, Section 107(d)(1), because the boundary includes the three monitors that did not meet the eight-hour ozone standard based on the three most recent years of monitoring data. Anthropogenic sources inside the boundary option contribute to the eight-hour violations in northeastern Maricopa County. Conversely, emission sources in these rural areas are insignificant and do not contribute to violations in the upwind urbanized area.

It is important to emphasize that only three monitors in the Phoenix-Mesa Metropolitan Statistical Area violated the eight-hour ozone standard based on the most recent three years of data (2000-2002) and each of these monitors had a three-year average of .085 ppm, which is only .001 ppm above the standard. Because the monitored violations are only slightly higher than the standard, EPA has indicated that the Maricopa County nonattainment area is likely to be classified as Marginal for eight-hour ozone. Recent EPA guidance states that “*Areas ... with ozone concentrations close to the level of the NAAQS (e.g., within .005 ppm), will most likely come into attainment within 3 years after designation as nonattainment without any additional local planning as a result of national and/or regional emission control measures that are scheduled to occur.*” (FR, Vol. 68, No. 105, page 32831).

The national emission control measures scheduled to occur during the next few years include stricter Tier 2 tailpipe vehicle emission controls, heavy duty vehicle and engine standards, and low sulfur fuels. Since the nonattainment area designations for the new eight-hour standard will occur in early 2004, EPA anticipates that Marginal areas such as Maricopa County may meet the eight-hour ozone standard by 2007, due to federally-mandated emission controls alone.

The nonattainment boundary option shown in Figure ES-1 will be effective in reducing the urban emissions that cause violations of the eight-hour ozone standard in the Phoenix-Mesa Metropolitan Statistical Area. Reductions in volatile organic compounds and nitrogen oxides within the boundary option will result in attainment and maintenance of the eight-hour ozone standard at all monitors in the MSA, including the rural areas of Humboldt Mountain and Blue Point. To the extent that the ozone is being transported away from the Phoenix-Mesa MSA, reductions in emissions inside the boundary option will also reduce ozone concentrations at distant, downwind locations such as those monitored in the Tonto National Forest (30 miles away) and Hillside Ranger Station (58 miles away). This will ensure that wilderness areas, as well as people, are protected from the harmful effects of ozone pollution.

ANALYSIS SUPPORTING AN EIGHT-HOUR OZONE BOUNDARY OPTION FOR THE MARICOPA COUNTY NONATTAINMENT AREA

INTRODUCTION

In July 1997, the Environmental Protection Agency (EPA) promulgated the new eight-hour ozone National Ambient Air Quality Standard (NAAQS) and requested that States recommend nonattainment area boundaries by June 30, 2000. Following the resolution of legal challenges on the eight-hour ozone standard, EPA set July 15, 2003 as the new deadline for States to recommend eight-hour ozone nonattainment area boundaries.

Clean Air Act Section 107(d)(1)(A) defines a nonattainment area as any area that does not meet or that contributes to ambient air quality in a nearby area that does not meet the National Ambient Air Quality Standard. The EPA presumption is that nonattainment boundaries should be the Metropolitan Statistical Area or the Consolidated Metropolitan Statistical Area for all classifications under the eight-hour standard. The Phoenix-Mesa Metropolitan Statistical Area, which includes all of Maricopa and Pinal Counties, an area of 14,600 square miles, will become the eight-hour ozone nonattainment area, unless an alternative boundary is recommended by the Governor of Arizona and approved by EPA.

EPA will use verified eight-hour ozone monitoring readings for the three-year period, 2001-2003, to determine if an area is in attainment or nonattainment. On the basis of unverified May 2003 data, the Humboldt Mountain monitor located in Northeastern Maricopa County may violate the eight-hour ozone standard in the Phoenix-Mesa Metropolitan Statistical Area (MSA). If the 2003 data are valid, EPA will designate the MSA, or an alternative boundary recommended by the Governor, as a nonattainment area for eight-hour ozone by April 15, 2004. EPA guidance issued May 14, 2003 indicates that this nonattainment area is likely to be classified as "Marginal" for the eight-hour ozone standard and may be required to attain the standard at all monitors as early as 2007. EPA guidance also indicates that (as yet unspecified) transportation conformity tests will have to be applied for the new eight-hour ozone nonattainment area.

States may request that nonattainment areas be smaller than the Metropolitan Statistical Area where counties generally are considered to be rural due to relatively small populations or a low degree of urbanization. For counties or MSAs that are exceptionally large and that have distinct parts such that emissions in one part of the county or Metropolitan Statistical Area do not cause or contribute to an air quality problem in other parts of counties or MSAs, the nonattainment area may include parts of counties or MSAs. In these cases, the State must provide a rationale for its recommendation, explaining how the boundary is consistent with Clean Air Act requirements. A general discussion of the rationale for defining an eight-hour ozone boundary that is smaller than the Phoenix-Mesa MSA is provided below.

RATIONALE FOR THE EIGHT-HOUR OZONE BOUNDARY OPTION

Figure 1 illustrates the boundary option that is proposed for the eight-hour ozone nonattainment area. As discussed below, this boundary was derived based upon a thorough evaluation of the eleven factors identified in the EPA guidance. It includes the Urban Planning Area and an additional 343 square miles around two nearby receptors in eastern and northeastern Maricopa County. It is important to note that the designation of the Indian Communities is under the jurisdiction of the Environmental Protection Agency (EPA) and this report does not address the designation of the Indian Communities. The American Indian Communities shown in Figure 1 will make their own recommendations for designations to EPA.

According to the Clean Air Act [Section 107(d)(1)(A)(i)], a nonattainment area is defined as “*any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.*” The primary and secondary standards are not met if the three-year average of the fourth highest eight-hour ozone concentration is .085 parts per million (ppm) or higher. EPA has established a three-year average measure for “not meeting” or “violating” the standard, because meteorology can have a significant impact on ozone concentrations during any single year and a multi-year average is more representative of actual trends in ambient air quality.

Data for 2000-2002 indicates that three monitors in the Phoenix-Mesa Metropolitan Statistical Area (MSA) did not meet the eight-hour ozone standard. Each of these monitors violated with a three-year average (of the fourth-highs) of .085 ppm, which is only .001 ppm above the standard. EPA guidance issued June 2, 2003 indicates that the Maricopa County area is likely to be classified as a Marginal nonattainment area for eight-hour ozone, because monitored violations are only slightly higher than the standard. Recently, an EPA representative confirmed that this nonattainment area is likely to be classified as Marginal. The EPA guidance pertaining to Marginal areas also states:

Areas covered under either subpart 1 or 2 with ozone concentrations close to the level of the NAAQS (e.g., within .005 ppm), will most likely come into attainment within 3 years after designation as nonattainment without any additional local planning as a result of national and/or regional emission control measures that are scheduled to occur. We have good reason to believe these areas will come into attainment. Regional scale modeling for national rules, such as the NOx SIP Call and Tier II motor vehicle tailpipe standards, demonstrates major ozone benefits for the 3-year period of 2004-2006. This period would be relevant for demonstrating attainment within 3 years of designation, assuming designations occur in early 2004. Many similar areas classified as marginal for the 1-hour ozone NAAQS in 1990 came into attainment within the initial 3-year period. (FR, Vol. 68, No. 105, page 32831).

The three monitors in the Phoenix-Mesa Metropolitan Statistical Area that violated the standard by .001 ppm in 2000-2002 are located in central and northeastern Maricopa County, inside the nonattainment boundary option shown in Figures 1 and 2. In May 2003, there were thirteen exceedances of the eight-hour ozone inside the nonattainment boundary option. In contrast, none of the monitors in Pinal County has violated the eight-hour ozone standard.

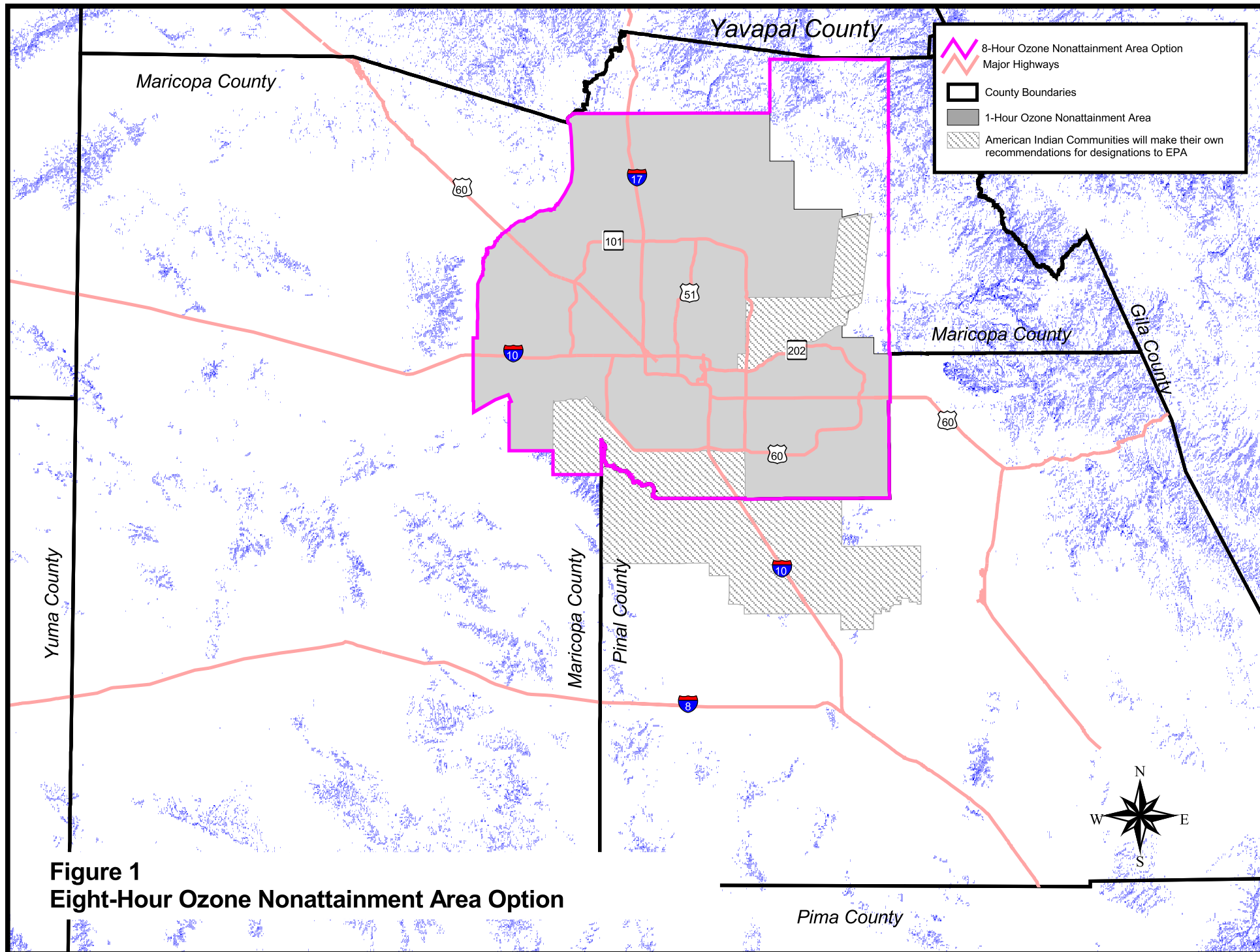


Figure 1
Eight-Hour Ozone Nonattainment Area Option

A nonattainment area boundary must also include areas that “contribute to” air quality in nearby areas that do not meet the standard. Due to their proximity to the three violating monitors in central and northeastern Maricopa County, the population, employment and vehicle travel in Maricopa County are the principal human activities contributing to violations of the eight-hour ozone standard in the MSA.

A small portion of Pinal County (the Apache Junction area) is contiguous to the urbanized area in Maricopa County, but represents only 2.4 percent of the urbanized area, based on the 2000 Census. Due to its small size, the prevailing wind patterns, and major distance from the violating monitors in central and northeastern Maricopa County, it is reasonable to conclude that Pinal County does not contribute to eight-hour ozone violations in Maricopa County. Documentation to support exclusion of Pinal County from the nonattainment boundary is contained in the Pinal County Air Quality Control District report, “Affirmative Proposal for the Eight-Hour Ozone Standard Designation,” June 2003.

As allowed in the EPA guidance, rural areas of Maricopa County have also been excluded from the eight-hour ozone boundary option. The MAG Urban Planning Area (UPA), which was designated as the boundary for the one-hour ozone nonattainment area in 1978, contains most of the urban activity and will absorb much of the future growth in Maricopa County. In 2000, the Urban Planning Area included 97.6 percent of the urbanized area, 98.4 percent of the population, and 98.5 percent of the employment in Maricopa County. By 2020, the Urban Planning Area will encompass 92.7 percent of the population and 94.0 percent of the employment in Maricopa County. In addition, over this twenty year period, 84.5 percent of the population growth and 88.3 percent of the employment growth in Maricopa County will occur *inside* the UPA boundary.

Although the Urban Planning Area boundary captures the major *sources* of emissions in Maricopa County, it does not include two *nearby receptors* located in rural areas. The Humboldt Mountain monitor, which is about seven miles northeast of the UPA, violated the eight-hour ozone standard in 2000-2002. The Blue Point monitor, less than two miles east of the UPA, had a 2000-2002 average fourth-high of .084 ppm. Since these two receptors are close to the source area and either violated or nearly violated the standard, the areas to the east and north where these monitors are located are included in the boundary option.

The monitor in the Tonto National Forest in Gila County also exceeded the eight-hour ozone standard in 2002. However, this monitor did not *violate* the standard, because it had only been in operation for one year and therefore, had not recorded the three years of data required to calculate an average. In addition, the Tonto monitor is located at a distant thirty miles east of the Urban Planning Area boundary. Another monitor that records high ozone levels, but does not violate the standard, is located at the Hillside Ranger Station in rural Yavapai County, about 58 miles northwest of the UPA boundary. The Arizona Department of Environmental Quality activated the Hillside monitor to provide background eight-hour ozone concentrations; that is, readings that were not influenced by local, upwind sources of ozone precursor emissions, such as the Phoenix metropolitan area. Because the Tonto and Hillside monitors are a considerable distance from the Urban Planning Area, other sources, such as biogenics and transport from other areas, may be more significant contributors to the high concentrations at these remote, rural monitors.

A comparison of maximum eight-hour readings in 2002 reveals that the concentrations recorded at Humboldt Mountain were at least .002 ppm greater than the comparable first through fourth-highest readings at Tonto National Forest. The maximum concentrations at Humboldt were also greater than or equal to each of the four highest readings at Hillside in 2002. As previously stated, the elevated concentrations recorded at these rural monitors may be attributable to sources other than the Phoenix-Mesa MSA. However, if anthropogenic emissions from the MSA are contributing to the highest ozone concentrations at the Tonto and/or Hillside monitors, then controlling emissions to attain the standard at Humboldt Mountain, which has higher concentrations due to its proximity to the Urban Planning Area, will also achieve attainment at the Tonto and Hillside monitors. According to the latest EPA guidance, attainment at Humboldt Mountain and all other monitors within the eight-hour ozone nonattainment area may have to be achieved as soon as three years after EPA designates the nonattainment boundaries, which will occur by April 15, 2004.

In conclusion, since most of the people will live, work, or travel inside the boundary option through 2020, this represents an effective boundary for controlling the anthropogenic sources of emissions that contribute to elevated ozone levels in the MSA. In addition, the most recent air quality data indicates that nearby monitors that violate or nearly violate the standard should be included within the eight-hour boundary option. The boundary in Figure 1 satisfies these criteria and is therefore the most appropriate designation for the eight-hour ozone nonattainment area in the Phoenix-Mesa MSA. The next section describes the results of the technical analysis performed to demonstrate that the boundary option in Figure 1 satisfies EPA guidance and Clean Air Act requirements for drawing eight-hour ozone nonattainment area boundaries.

TECHNICAL ANALYSIS

According to EPA guidance dated March 28, 2000, a State wishing to propose a smaller boundary than the MSA should address how each of the following eleven factors affect the drawing of the boundaries: emissions and air quality in adjacent areas; population density and degree of urbanization including commercial development; monitoring data representing ozone concentrations in local areas and larger areas; location of emission sources; traffic and commuting patterns; expected growth; meteorology; geography and topography; jurisdictional boundaries; level of control of emission sources; and regional emission reductions. An analysis has been conducted to address each of these pertinent factors. In addition, EPA guidance requires consideration of how the resulting boundary is consistent with the definition of nonattainment in the Clean Air Act, Section 107(d)(1).

The Phoenix–Mesa Metropolitan Statistical Area includes all of Maricopa and Pinal Counties, an area of approximately 14,600 square miles. A vast majority of this land is undeveloped desert. The shaded area in Figure 1 represents the MAG Urban Planning Area (UPA), which was designated as the one-hour ozone nonattainment area in 1978. There have been no exceedances of the one-hour ozone standard recorded at any monitor in the MSA since 1996. As shown in Figure 1, the eight-hour ozone boundary option is 343 square miles larger than the one-hour ozone nonattainment area, and covers an area of 2,289 square miles in the central part of Maricopa County.

An analysis has been conducted to show how an evaluation of each of the eleven EPA factors resulted in a smaller nonattainment area boundary than the MSA, as shown in Figure 1. The analysis concludes that the eight-hour ozone boundary option is more appropriate than the MSA for the new eight-hour ozone standard.

Each of the factors is discussed below. Expected growth is addressed first because EPA representatives have indicated that this is an especially important factor in drawing the nonattainment boundary for the Phoenix-Mesa MSA.

Expected Growth

The U.S. Census estimates that 3.2 million people resided in the Phoenix-Mesa Metropolitan Statistical Area in 2000. A geographic information system (GIS) analysis of this data indicates that 93 percent of these residents lived within the eight-hour ozone boundary option. By 2020, the resident population in the MSA is expected to reach six million, with 80 percent living inside the boundary option.

In 2000, 95 percent of the jobs in the MSA were located inside the eight-hour ozone boundary option; in 2020, the proportion of MSA employees working inside the boundary option is expected to be 89 percent.

Table 1 compares current and future population and employment estimates for the Phoenix-Mesa MSA and the eight-hour ozone boundary option. It is clear from this data that most of the anthropogenic activity currently causing the formation of ozone in the MSA occurs within the boundary option.

Population in the Metropolitan Statistical Area is expected to grow by 85 percent between 2000 and 2020. Employment is projected to increase by about 80 percent over this same period. The boundary option will capture 65 percent of the population growth and 81 percent of the employment growth over this twenty year period. Table 1 provides clear evidence that the anticipated growth in population and employment in the MSA will take place predominately within the eight-hour ozone boundary option.

Although most of the growth will take place inside the boundary option, the Arizona Legislature has defined Area A (See Figure 2) to provide a “safety margin” for population and employment growth that occurs outside the boundary option. Since Area A controls measures already apply to sources adjacent to the eight-hour boundary option, expansion of this boundary would have a minimal marginal effect in reducing ozone precursor emissions in the MSA.

While population, employment, and vehicle travel in the Phoenix metropolitan area are expected to continue growing rapidly over the next twenty years, this growth will not increase ozone precursor emissions or ozone concentrations. In fact, as shown in Tables 2 and 3, VOC and NO_x emissions from anthropogenic sources (excluding biogenics) are expected to decline by 16.4 percent and 13.2 percent, respectively, between 1999 and 2015, at the same time population and employment in Maricopa County will grow by more than 50 percent. More dramatically, emissions from onroad mobile sources will decline by more than 55 percent over this period, while vehicle miles of travel

**TABLE 1: Comparison of Population and Employment Estimates
for the Phoenix-Mesa Metropolitan Statistical Area and
the Eight-Hour Ozone Nonattainment Boundary Option**

| | POPULATION | | | EMPLOYMENT¹ | | |
|-------------|-------------------|------------------------|----------|-------------------------------|------------------------|----------|
| | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> |
| 2000 | 3,278,100 | 3,050,000 | 93.0% | 1,614,000 | 1,539,000 | 95.4% |
| 2010 | 4,581,000 | 4,024,000 | 87.8% | 2,222,000 | 2,056,000 | 92.5% |
| 2020 | 6,077,000 | 4,870,000 | 80.1% | 2,891,000 | 2,579,000 | 89.2% |

| | POPULATION GROWTH | | | EMPLOYMENT GROWTH | | |
|------------------|--------------------------|------------------------|----------|--------------------------|------------------------|----------|
| | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> |
| 2000-2010 | 1,302,900 | 974,000 | 74.8% | 608,000 | 517,000 | 85.0% |
| 2000-2020 | 2,798,900 | 1,820,000 | 65.0% | 1,277,000 | 1,040,000 | 81.4% |

| | POPULATION DENSITY (sq. mi.)² | | | EMPLOYMENT DENSITY (sq. mi.)³ | | |
|-------------|---|------------------------|----------|---|------------------------|----------|
| | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> | <u>MSA</u> | <u>Boundary Option</u> | <u>%</u> |
| 2000 | 702.7 | 671.8 | 95.6% | 378.7 | 373.7 | 98.7% |
| 2010 | 1022.6 | 912.4 | 89.2% | 537.7 | 523.6 | 97.4% |
| 2020 | 1434.9 | 1090.9 | 76.0% | 669.1 | 631.0 | 94.3% |

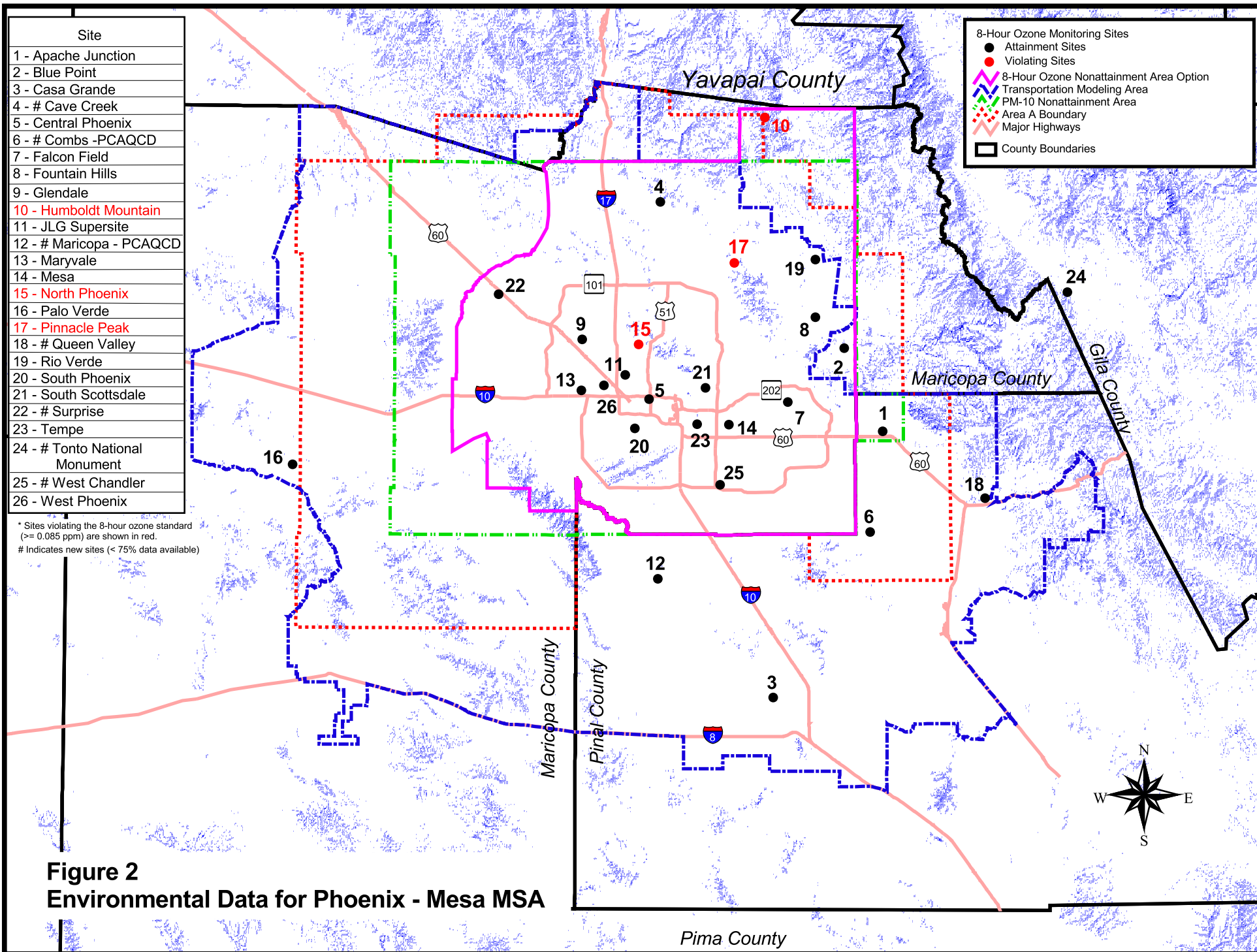
MSA = Phoenix-Mesa Metropolitan Statistical Area = Maricopa and Pinal Counties
Boundary Option = Eight-Hour Ozone Nonattainment Area Boundary Option

¹Employment at place of work (jobs)

²Area in which density is > 1,000 persons per square mile

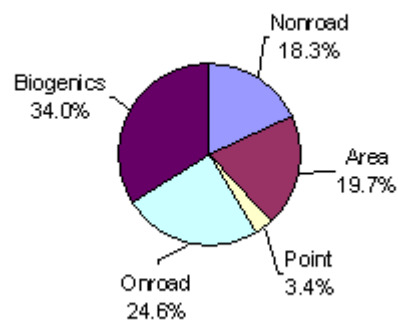
³Area in which density is > 1,000 employees per square mile

Source: 2000 U.S. Census and MAG Draft 3 Interim Socioeconomic Projections.

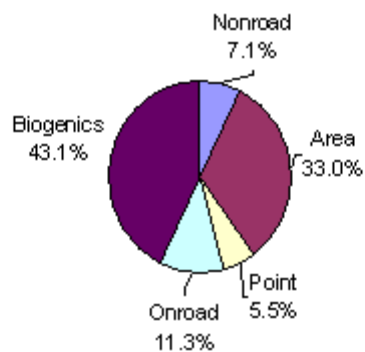


**TABLE 2: Summary of Volatile Organic Compound (VOC) Emissions
for the Maricopa County One-Hour Ozone Modeling Area**

| 1999 | | |
|-----------------|--------------|------------------|
| Source Category | VOC (mt/day) | Percent of Total |
| Nonroad | 83.4 | 18.3% |
| Area | 89.6 | 19.7% |
| Point | 15.6 | 3.4% |
| Onroad | 112.1 | 24.6% |
| Biogenics | 155.1 | 34.0% |
| Total | 455.8 | 100% |



| 2015 | | |
|-----------------|--------------|------------------|
| Source Category | VOC (mt/day) | Percent of Total |
| Nonroad | 31.5 | 7.1% |
| Area | 145.4 | 33.0% |
| Point | 24.3 | 5.5% |
| Onroad | 50.1 | 11.3% |
| Biogenics | 190.2 | 43.1% |
| Total | 441.5 | 100% |

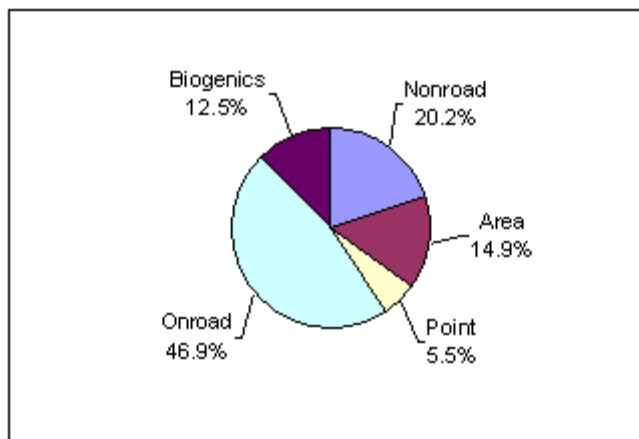


Source: Preliminary modeling for the MAG One-Hour Ozone Maintenance Plan, based on the July 17, 1999 episode.

**TABLE 3: Summary of Nitrogen Oxide (NOx) Emissions
for the Maricopa County One-Hour Ozone Modeling Area**

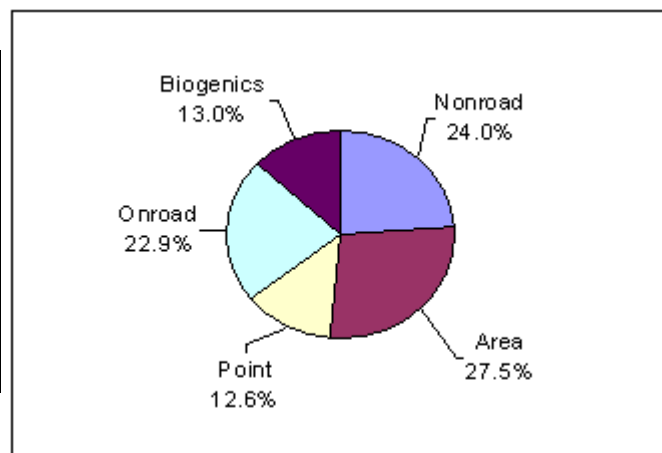
1999

| Source Category | NOx (mt/day) | Percent of Total |
|-----------------|--------------|------------------|
| Nonroad | 61.5 | 20.2% |
| Area | 45.3 | 14.9% |
| Point | 16.7 | 5.5% |
| Onroad | 143.1 | 46.9% |
| Biogenics | 38.2 | 12.5% |
| Total | 304.8 | 100% |



2015

| Source Category | NOx (mt/day) | Percent of Total |
|-----------------|--------------|------------------|
| Nonroad | 63.9 | 24.0% |
| Area | 73.2 | 27.5% |
| Point | 33.4 | 12.6% |
| Onroad | 60.8 | 22.9% |
| Biogenics | 34.7 | 13.0% |
| Total | 266.0 | 100% |



Source: Preliminary modeling for the MAG One-Hour Ozone Maintenance Plan, based on the July 17, 1999 episode.

in the region will increase by 65 percent. This is a continuation of trends during the past six years in which one-hour ozone concentrations in the nonattainment area have declined, at the same time County population has increased by 24 percent. In the future, the control measures imposed in Area A (i.e., inspection/maintenance, clean burning gasoline, Stage II vapor recovery, and employer trip reduction programs) and stricter federally-mandated Tier 2 light duty and heavy duty vehicle emission standards and low sulfur fuels will more than offset the expected growth in population, employment and vehicle travel in the Maricopa County area.

Emissions and Air Quality in Adjacent Areas

Emissions. Tables 2 and 3 summarize current and future volatile organic compound (VOC) and nitrogen oxide (NO_x) emissions for the one-hour ozone modeling area. Figures 3 through 6 show the comparable emission densities for anthropogenic sources in 1999 and 2015. These figures reveal that 85 percent or more of the ozone precursors will continue to be emitted within the eight-hour boundary option through 2015. There are no sources of VOCs emitting more than 250 kg/day outside the boundary option in 1999. Collectively, the sources outside the boundary emit only five percent of the total VOCs. In 1999 the NO_x sources emitting more than 250 kg/day outside the boundary are primarily highway vehicles, but all of the outside sources produce only six percent of the total NO_x emissions. In 2015, there are a cluster of power plants outside the boundary option in western Maricopa County that emit more than 250 kg/day of VOCs and NO_x. These are located twenty miles or more from the boundary, which limits their impact on ozone formation in the Valley. In spite of these power plants, the boundary option captures 93 percent of the total VOC emissions in 2015. The highest source of NO_x emissions located outside the boundary in 2015 (shown as a black grid in Figure 6) is the Gila Compressor Station. Although this Station has the *potential* to produce emissions in the future, it has not been in operation since 1996. As a worst case, if this station becomes operational again by 2015, the emissions captured by the boundary option will still represent 85 percent of the total NO_x emissions.

Because most of the anthropogenic sources are located inside the boundary option, emission controls on these sources will achieve attainment of the eight-hour standard throughout the entire MSA. In addition, many of these controls already apply to Area A (See Figure 2). The Arizona Legislature defines the boundaries for Area A and requires various air quality measures to be implemented within the Area A boundary. Area A ensures that anthropogenic emissions from sources adjacent to the boundary option will not cause or contribute to eight-hour violations in the MSA. Expanding the eight-hour boundary option to include the sources in Area A will not accelerate attainment of the standard.

Air Quality. According to the Clean Air Act, Section 107(d)(1), the definition of nonattainment includes any area that does not meet the national air quality standards. The new eight-hour ozone standard is 0.08 parts per million for a three year average of the fourth highest reading. Violations of the eight-hour ozone standard occurred at three of nineteen monitoring sites operating in the MSA during the most recent three year period, 2000-2002. The three monitors recording violations were North Phoenix, Pinnacle Peak, and Humboldt Mountain (see Table 4). All three of these sites are located inside the eight-hour ozone boundary option (see Figure 2).

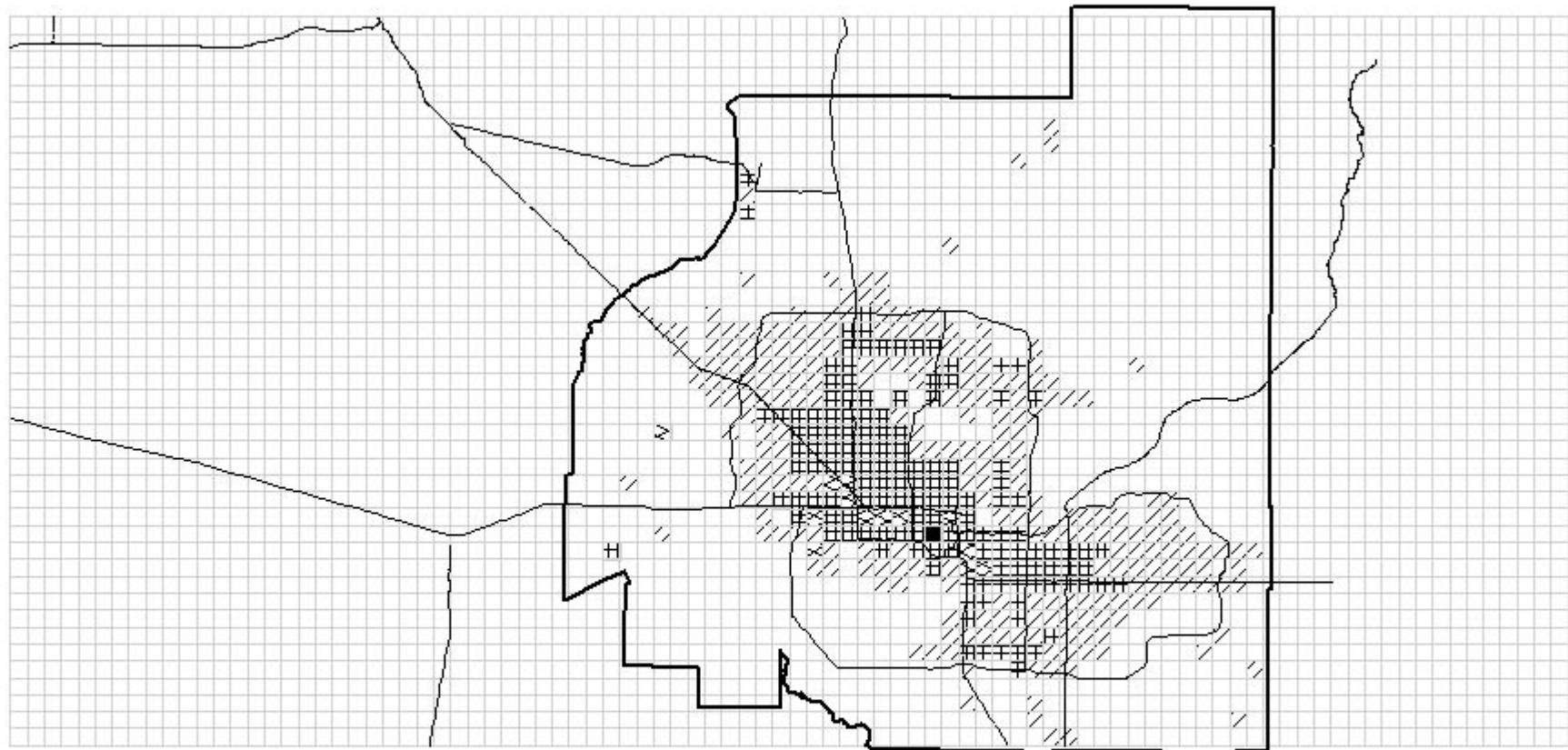
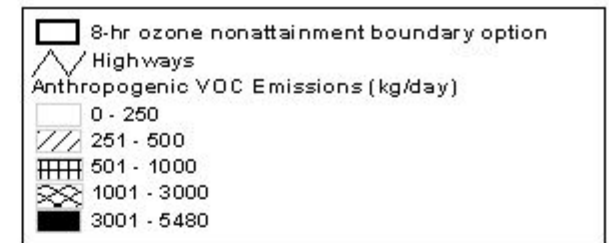


FIGURE 3. Anthropogenic VOC Emissions for August 24, 1999 - Base Case
 Total Emissions = 300,634 kg/day
 8-hr ozone nonattainment boundary option emissions = 284,953 kg/day
 Percent of emissions in 8-hr ozone nonattainment boundary option = 95%

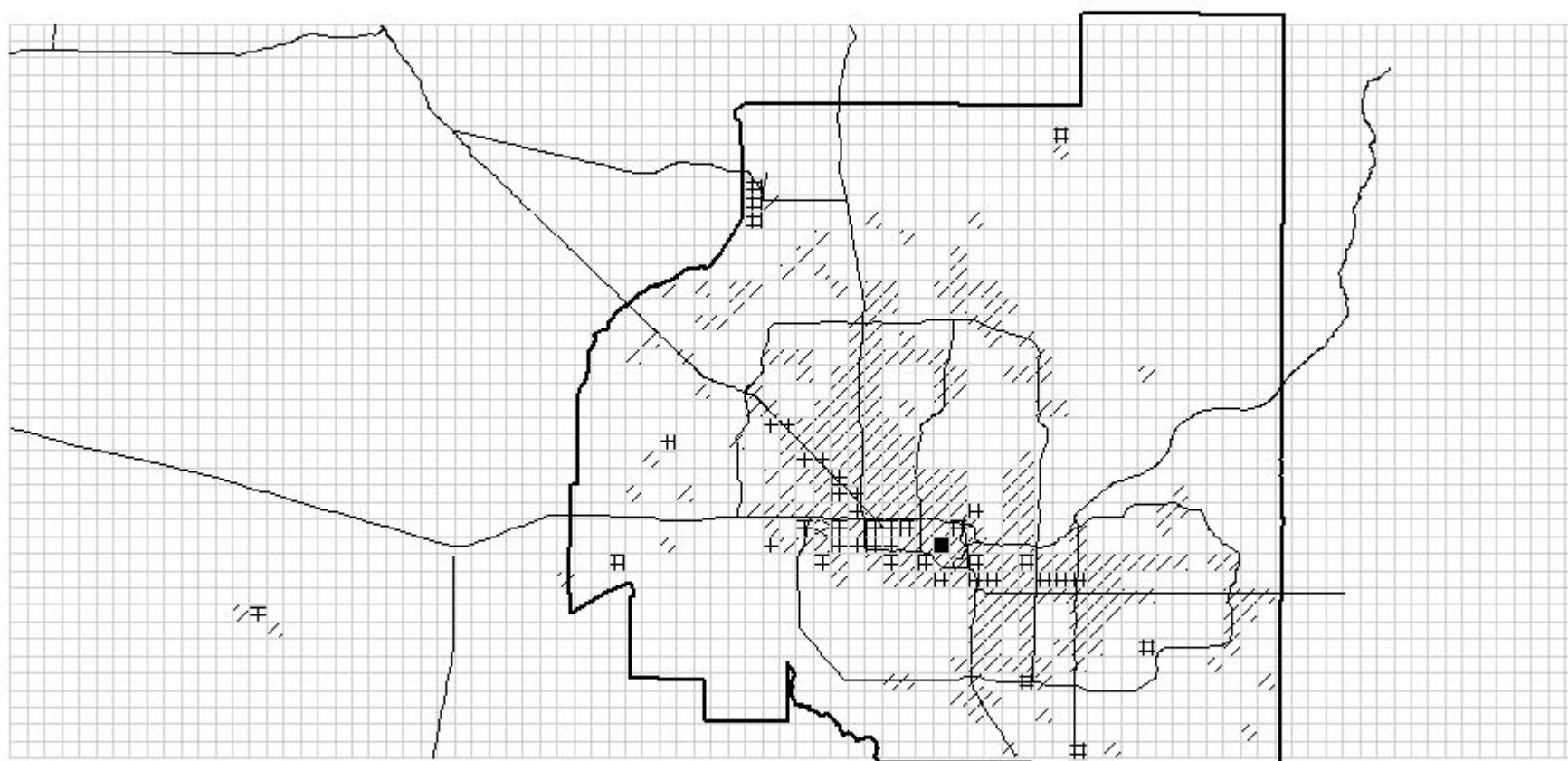
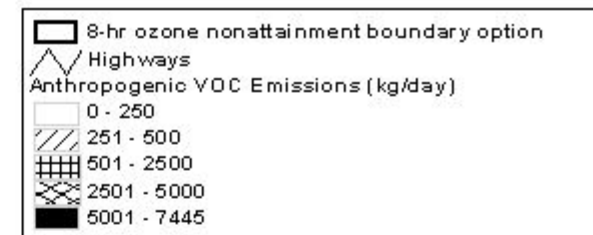


Figure 4. Anthropogenic VOC Emissions for August 24, 2015.

Committed Measures Package

Total Emissions = 239,374 kg/day

8-hr ozone nonattainment boundary option emissions = 222,035 kg/day

Percent of emissions in 8-hr ozone nonattainment boundary option = 93%

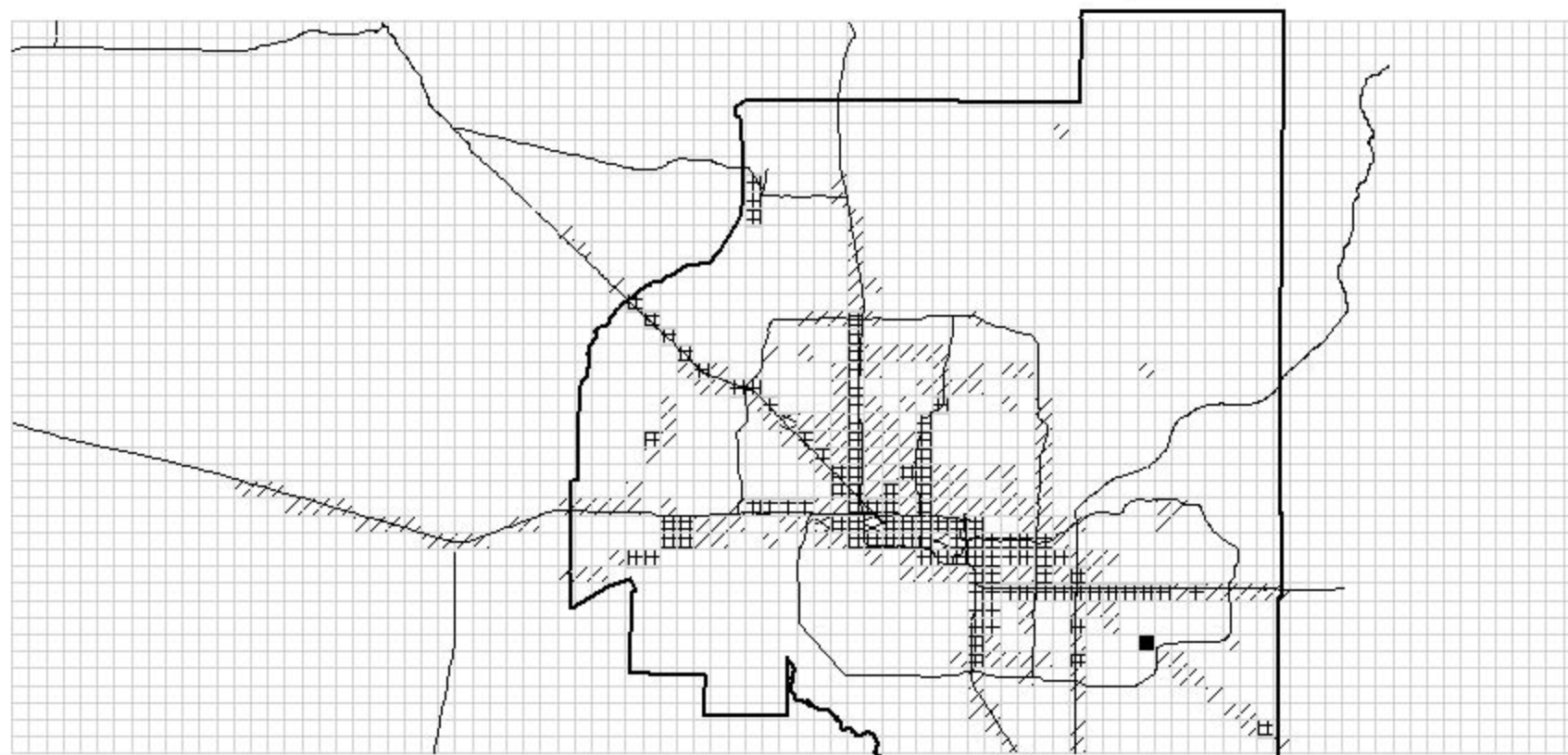
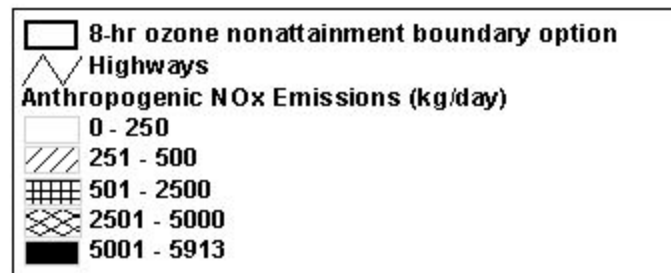


FIGURE 5. Anthropogenic NO_x Emissions for August 24, 1999 - Base Case
 Total Emissions = 266,656 kg/day
 8-hr ozone nonattainment boundary option emissions = 250,480 kg/day
 Percent of emissions in 8-hr ozone nonattainment boundary option = 94%

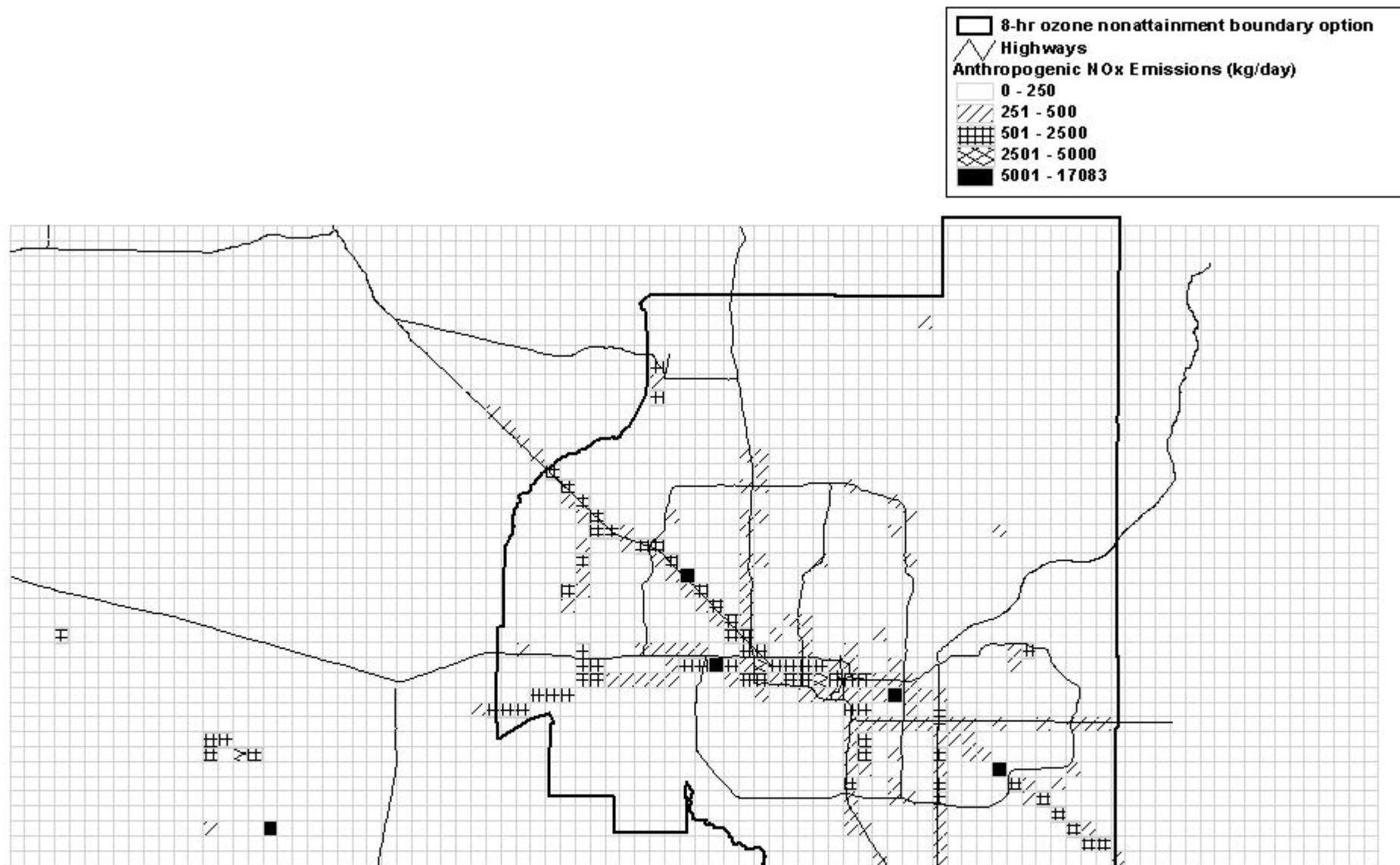


Figure 6. Anthropogenic NOx Emissions for August 24, 2015.

Committed Measures Package

Total Emissions = 250,381 kg/day

8-hr ozone nonattainment boundary option emissions = 212,714 kg/day

Percent of emissions in 8-hr ozone nonattainment boundary option = 85%

TABLE 4: 2000-2002 Eight-Hour Average Ozone Summary

| Site | 3 Year Average of the 4 th Highest Annual Ozone Concentration (in ppm) 2000-2002* |
|--------------------------------|--|
| 1 - Apache Junction | .080 |
| 2 - Blue Point | .084 |
| 3 - Casa Grande | .079 |
| 4 - # Cave Creek | N/A |
| 5 - Central Phoenix | .075 |
| 6 - # Combs - PCAQCD | N/A |
| 7 - Falcon Field | .080 |
| 8 - Fountain Hills | .084 |
| 9 - Glendale | .080 |
| 10 - Humboldt Mountain | .085 |
| 11 - JLG Supersite | .077 |
| 12 - # Maricopa - PCAQCD | N/A |
| 13 - Maryvale | .079 |
| 14 - Mesa | .073 |
| 15 - North Phoenix | .085 |
| 16 - Palo Verde | .077 |
| 17 - Pinnacle Peak | .085 |
| 18 - # Queen Valley | N/A |
| 19 - Rio Verde | .084 |
| 20 - South Phoenix | .080 |
| 21 - South Scottsdale | .078 |
| 22 - # Surprise | N/A |
| 23 - Tempe | .079 |
| 24 - # Tonto National Monument | N/A |
| 25 - # West Chandler | N/A |
| 26 - West Phoenix | .080 |

* Sites violating the eight-hour ozone standard ($\geq .085$ ppm) are shown in red.

Indicates new sites ($< 75\%$ data available)

Source: ADEQ; Data Management Team, January 30, 2003.

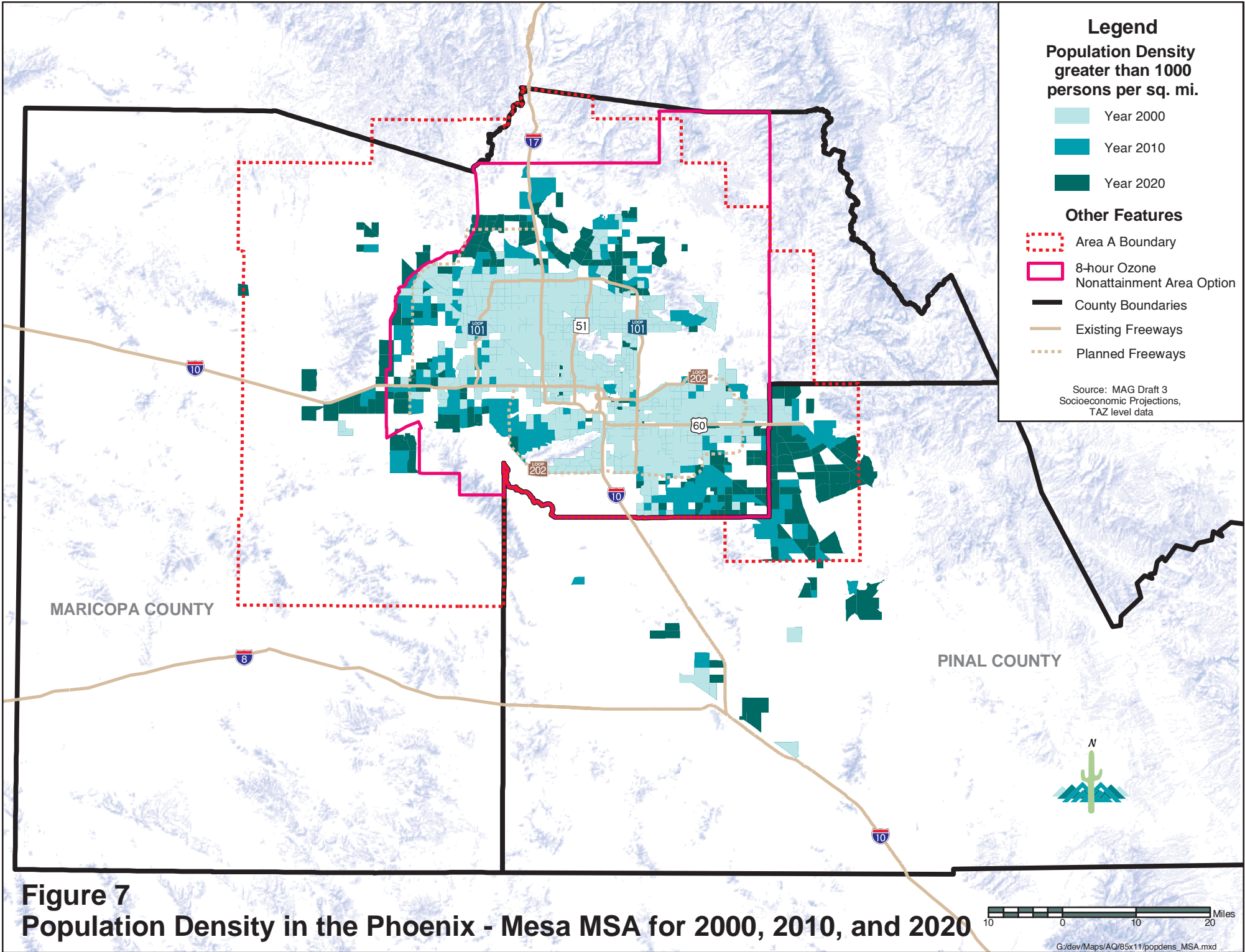
The North Phoenix monitor is located in the urbanized area, as defined by the 2000 U.S. Census. The Pinnacle Peak and Humboldt Mountain monitors are located northeast of the urbanized area. Humboldt Mountain is located in a rural area adjacent to the Tonto National Forest where biogenic emissions also contribute to higher ozone concentrations. The eight-hour ozone nonattainment area boundary option has been expanded to include this monitor because it is within seven miles of the MAG Urban Planning Area and violated the eight-hour standard, based on 2000-2002 monitoring data. In addition, the Blue Point monitor in eastern Maricopa County has been included within the boundary option, because it is less than two miles from the UPA and recorded ozone concentrations close to the standard in 2000-2002.

The monitor in the Tonto National Forest in Gila County also exceeded the eight-hour ozone standard in 2002. However, this monitor did not *violate* the standard, because it had only been in operation for one year and therefore, had not recorded the three years of data required to calculate an average. In addition, the Tonto monitor is located at a distant thirty miles east of the Urban Planning Area boundary. Another monitor that records high ozone levels, but does not violate the standard, is located at the Hillside Ranger Station in rural Yavapai County, about 58 miles northwest of the UPA boundary. The Arizona Department of Environmental Quality expected the Hillside monitor to provide background eight-hour ozone concentrations; that is, readings that were not influenced by local, upwind sources of ozone precursor emissions, such as the Phoenix-Mesa MPA. Because the Tonto and Hillside monitors are a major distance from the Urban Planning Area, other sources, such as biogenics and transport from other areas, may be more significant contributors to the high concentrations at these remote, rural monitors.

A comparison of maximum eight-hour readings in 2002 reveals that the concentrations recorded at Humboldt Mountain were at least 2 ppb greater than the comparable first through fourth-highest readings at Tonto National Forest. The maximum concentrations at Humboldt were also greater than or equal to each of the four highest readings at Hillside in 2002. As previously stated, the elevated concentrations recorded at these rural monitors may be attributable to sources other than the Phoenix-Mesa MSA. However, if anthropogenic emissions from the MSA are contributing to the highest ozone concentrations at the Tonto and/or Hillside monitors, then controlling emissions to attain the standard at Humboldt Mountain, which has higher concentrations due to its proximity to the Urban Planning Area, will also achieve attainment at the Tonto and Hillside monitors. According to the EPA guidance dated June 2, 2003, attainment at Humboldt Mountain and all other monitors within the eight-hour ozone nonattainment area may have to be achieved as soon as three years after EPA designates the nonattainment boundaries in early 2004.

Population Density and Degree of Urbanization including Commercial Development

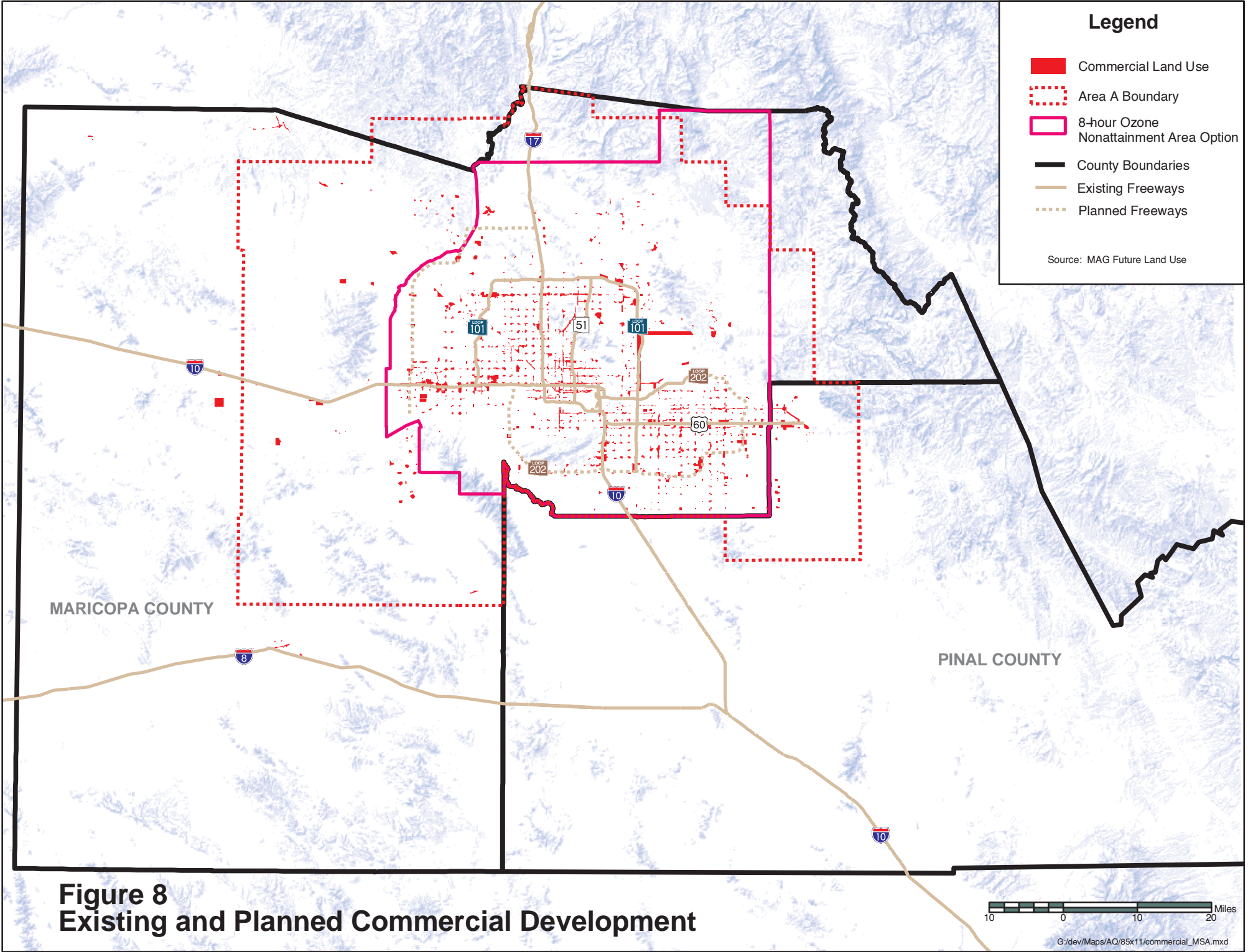
Population Density. Population densities provide an indication of the spatial distribution of emissions from residential sources. The population densities associated with the latest interim MAG population projections are illustrated in Figure 7. It is evident from this figure that the highest population densities will continue to occur within the eight-hour ozone boundary option.

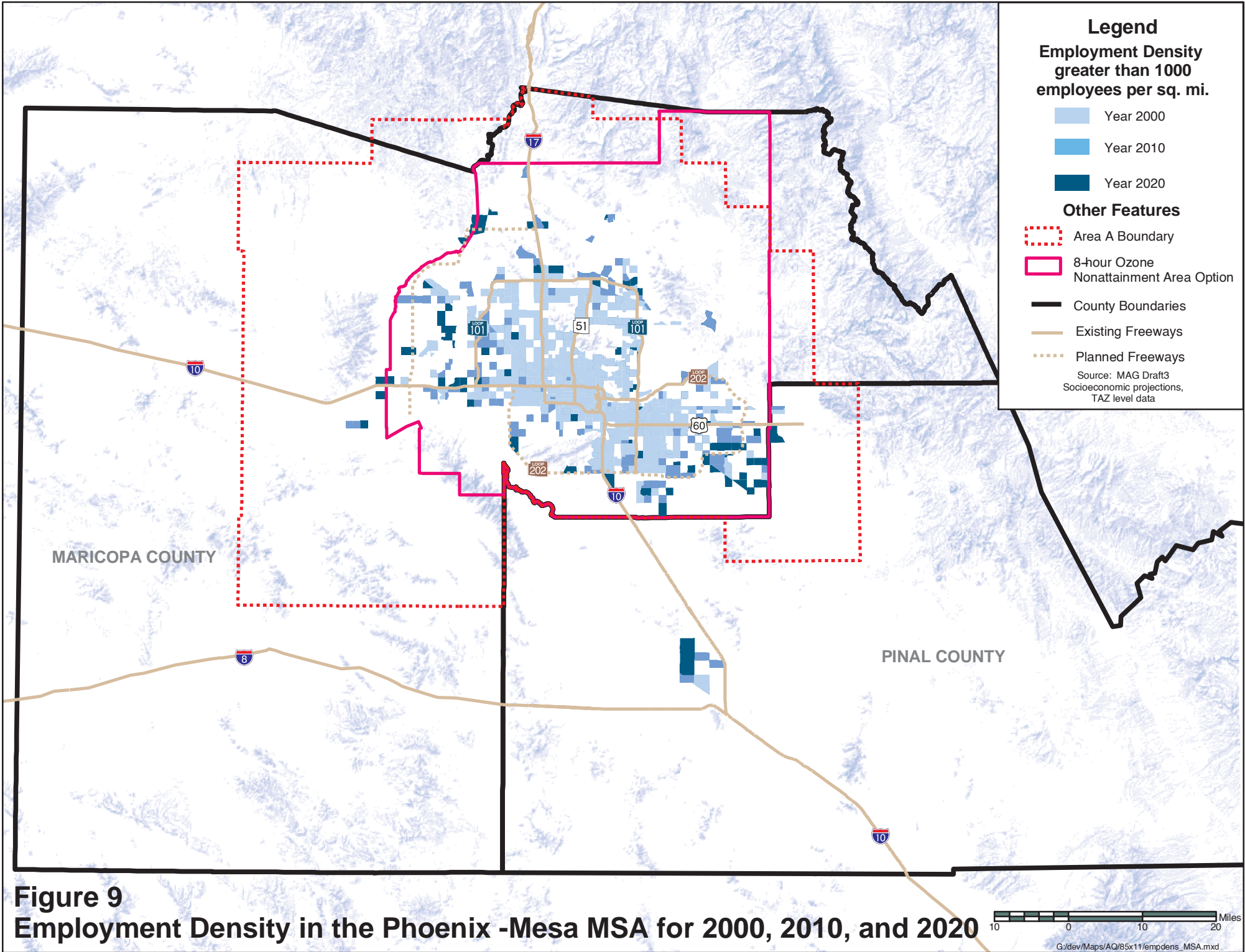


As Table 1 indicates, 96 percent of the MSA's most populated areas were located inside the eight-hour ozone boundary option in 2000. By 2020, 76 percent of the areas of highest populated densities will occur within the boundary option. It is especially important that the highest population densities are included within the boundary during the next five-ten years, when attainment of the eight-hour standard will be required. Although the number of people living outside the boundary option will increase over time, this growth will not cause or contribute significantly to new violations of the eight-hour ozone standard, because: (1) monitors outside the boundary option do not currently violate the eight-hour standard, (2) Area A controls will be imposed on most of these residents, and (3) stricter federal Tier 2 light duty vehicle and heavy duty vehicle controls and low sulfur fuels will reduce VOC and NOx produced by people living outside the boundary option.. In addition, EPA has proposed a comprehensive national program to reduce emissions from nonroad diesel engines and fuels (April 2003).

Degree of Urbanization. An urbanized area is defined as an area consisting of a central place and adjacent territory with a general population density of at least 1,000 people per square mile and a census population of at least 50,000. The combination of the Phoenix/Mesa and Avondale urbanized areas, as defined by the U. S. Census in 2002, will be referred to as the "urbanized area". In 2000, the urbanized area covered approximately 41 percent of the eight-hour ozone nonattainment area option and 5.6 percent of the MSA. The urbanized area of Pinal County outside the eight-hour ozone boundary option represented 2.4 percent of the total urbanized area and only 0.14 percent of the MSA in 2000. In 2020, the area in which population density exceeds 1,000 people per square mile in Pinal County is expected to expand, but this new area will represent only 1.8 percent of the MSA (see Figure 7). The urbanization of Pinal County will not cause or contribute significantly to new violations of the eight-hour ozone standard, because: (1) monitors in Pinal County do not currently violate the eight-hour standard, even though parts of Pinal County (i.e. Apache Junction) are already urbanized, (2) Area A controls will be imposed on most of the newly emerging urbanized areas of Pinal County, and (3) stricter federal Tier 2 light duty vehicle and heavy duty vehicle controls and low sulfur fuels will reduce VOC and NOx emissions in these areas, as well as in the remaining MSA. The proposed EPA nonroad diesel engines and fuel standards will also substantially reduce emissions, if they are implemented.

Commercial Development. Commercial development is one indicator of the spatial distribution of potential emissions from nonresidential sources. As shown in Figure 8, most of the existing and planned commercial development in the MSA is contained within the eight-hour ozone boundary option. Another proxy for emissions from commercial and industrial sources is employment density. Figure 9 illustrates areas in the MSA where employment density is expected to exceed 1,000 employees per square mile through 2020. In 2000, 95 percent of the employees in the MSA worked inside the eight-hour ozone nonattainment area option. In 2020, 89 percent of the employees in the MSA are expected to work within the eight-hour ozone boundary option. Nearly 99 percent of the MSA area with density greater than 1,000 employees per square mile was located inside the eight-hour ozone boundary option in 2000. In 2020, 94 percent of the area with the highest employment density will be within the boundary option. Since so few employees will work outside the boundary option, even in 2020, emissions from industrial and commercial activities outside the boundary option are not likely to cause or contribute significantly to new violations of the eight-hour ozone standard.





Monitoring Data Representing Ozone Concentrations in Local Areas and Larger Areas

Figure 2 illustrates the location of the ozone monitoring sites within the MSA, while Table 4 tabulates the 2000-2002 average of the fourth highest annual eight-hour ozone concentration at each site. Three monitors in the Maricopa County recorded violations of the eight-hour standard (i.e. 0.085 ppm or greater) in 2000-2002 and these are located inside the eight-hour ozone boundary option. The three ozone monitors in Pinal County (i.e. Apache Junction, Casa Grande, and Queen Valley) do not violate the eight-hour ozone standard.

Two of the monitoring sites in eastern and northeastern Maricopa County (i.e. Blue Point and Humboldt Mountain) are located on National Forest Service land. The Rio Verde monitor is also located in a very low density residential area on the edge of a Federal Class I Wilderness Area. The past violations recorded at these rural monitors may be caused by emissions produced in the urbanized area, as well as biogenic emissions at the rural monitor sites. The emissions from the urbanized area react photochemically in the presence of sunlight, and are transported by the prevailing winds to these remote locations. Emissions from sources in these remote areas do not cause or contribute to the eight-hour ozone violations in the urbanized portion of Maricopa County.

It is important to note that on May 30, 2001, the EPA published a final notice determining that Maricopa County had attained the one-hour ozone standard as a result of three years (1997-1999) without a monitored violation. For the years 2000-2002 there were also no one-hour ozone violations. Additionally, a comparison of monitoring data for 1998-2000, 1999-2001, and 2000-2002 in Table 5 indicates that eight-hour ozone levels declined or remained steady for all sites which exceeded the new standard during these periods. This suggests that the control measures already implemented within the one-hour ozone boundary and Area A have also been effective in reducing eight-hour ozone concentrations throughout the MSA.

Location of Emission Sources

Figures 3-6 illustrate that at least 85 percent of the anthropogenic emissions are concentrated inside the boundary option in 1999 and 2015. Figures 10 and 11 identify the locations of major point sources of volatile organic compounds and nitrogen oxides in 1999 and 2015. For VOCs, major point sources are those that emit more than 50 tons per year. For NO_x, the threshold for a major point source is 100 tons per year. Most of the point sources outside the boundary option are gas-fired power plants in western Maricopa County. In Figure 11 the Gila Compressor Station, southeast of these power plants, is only a *potential* source of NO_x in 2015, because this station has not been in operation since 1996. All of the major point sources that may be operating in western Maricopa County by 2015 are twenty miles or more away from the boundary option, which will diminish their contribution to future eight-hour ozone concentrations in the Valley.

**TABLE 5: 8-Hour Ozone Data Comparison
For Sites Violating the New Standard(>.084 ppm) in 2000, 2001, or 2002**

| Monitoring Site | 1998 through 2000 Average 4 th Highest Reading (ppm) | 1999 through 2001 Average 4 th Highest Reading (ppm) | 2000 through 2002 Average 4 th Highest Reading (ppm) |
|-------------------|---|---|---|
| Blue Point | .088 | .085 | .084 |
| Fountain Hills | .085 | .085 | .084 |
| Humboldt Mountain | .087 | .085 | .085 |
| Mount Ord | .089 | .085 | N/A |
| North Phoenix | .086 | .085 | .085 |
| Pinnacle Peak | .085 | .085 | .085 |
| West Phoenix | .086 | .082 | .080 |

Source: Maricopa County Environmental Services Division, 2000 and 2001 Network Review (MCESD, 2000, 2001) and 2002 Air Quality Report, Air Quality Division, Arizona Department of Environmental Quality (ADEQ, 2002).

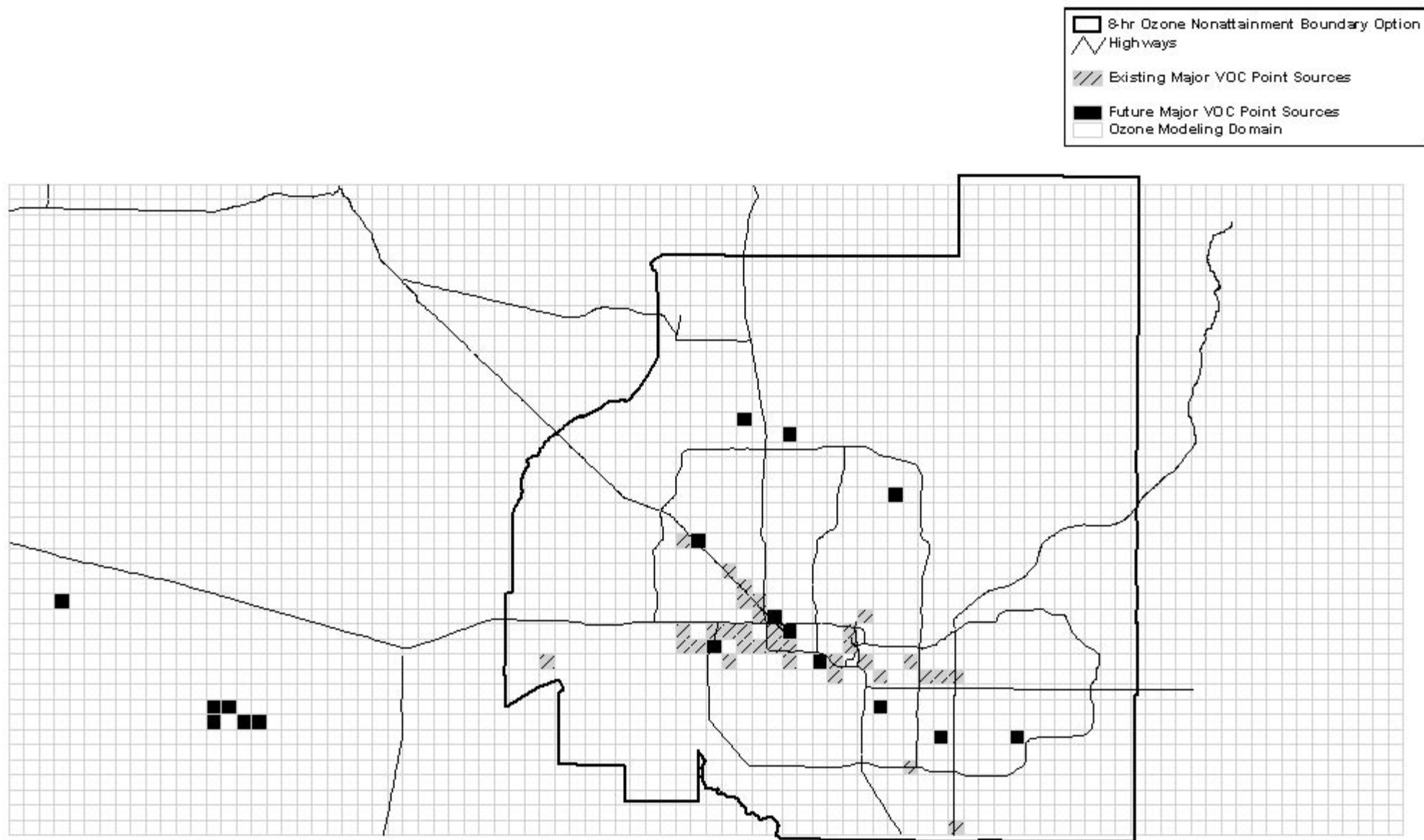


Figure 10. Existing and Future Major VOC Point Sources (>50 tons/year)

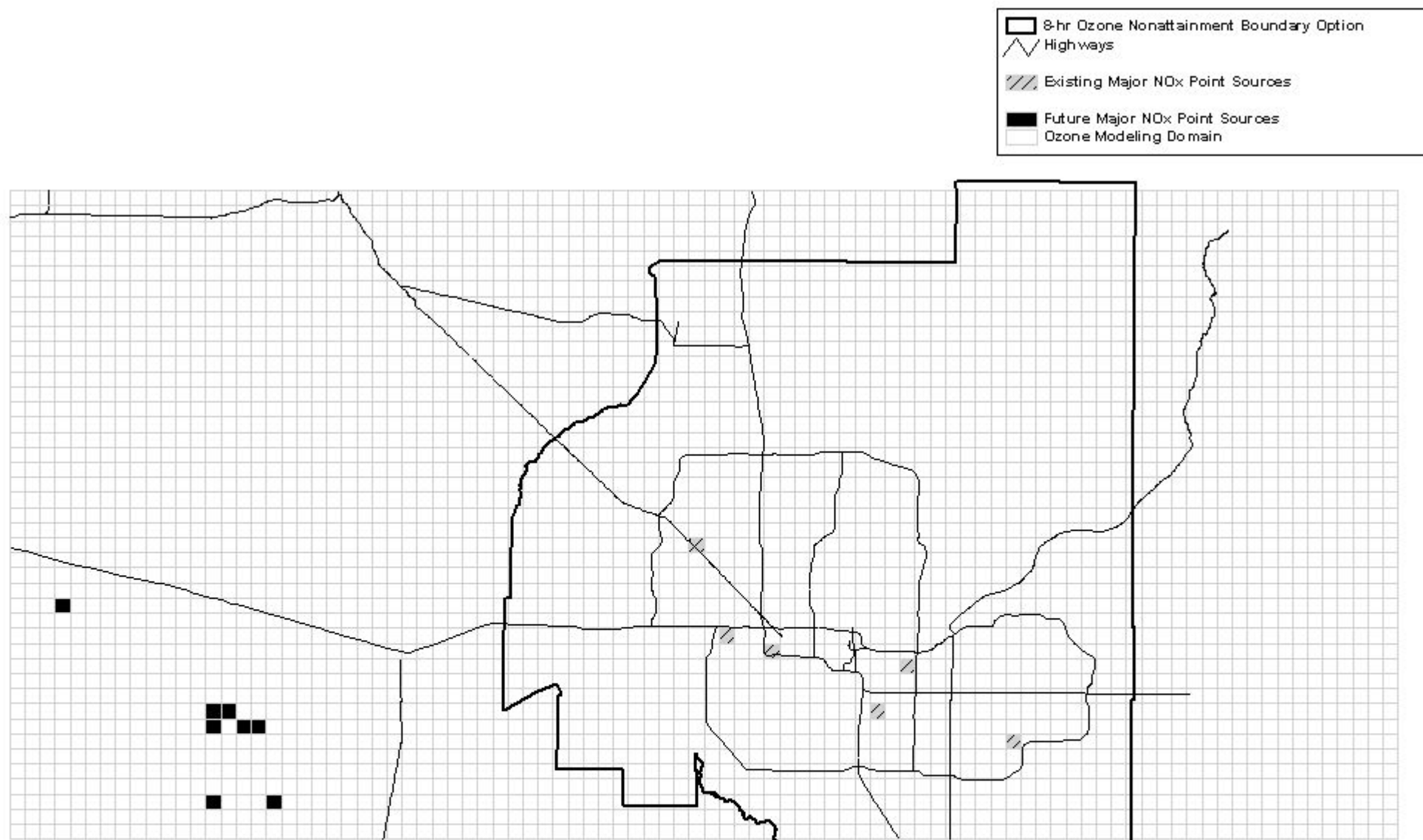


Figure 11. Existing and Future Major NO_x Point Sources (>100 tons/year)

Traffic and Commuting Patterns

Emissions from onroad motor vehicles are a significant source of ozone precursor emissions, accounting for 25 percent of the VOC emissions (see Table 2) and 47 percent of the NO_x emissions (see Table 3) in 1999. MAG transportation models estimate current and future vehicle travel using 2000 Census data and the latest socioeconomic projections. In 2000, vehicle miles of travel (VMT) within the eight-hour ozone boundary option were 87 percent of the total VMT in the transportation modeling area (see Figure 2). In 2020, 80 percent of the VMT in the transportation modeling area is expected to occur inside the boundary option. It is important to note that the transportation modeling area is extremely large since it was developed for use by MAG in preparing a new twenty-year Regional Transportation Plan with a forty-year vision.

Areas of congested traffic, particularly on freeways, provide one indication of where the highest onroad vehicle emissions are likely to occur. For purposes of this analysis, freeways are considered to be “congested” if the volume of vehicles on the freeway are 90 percent or more of its design capacity. Figure 12 illustrates freeway congestion in 2020, when VMT in the transportation modeling area is expected to be 80 percent higher than in 2000.

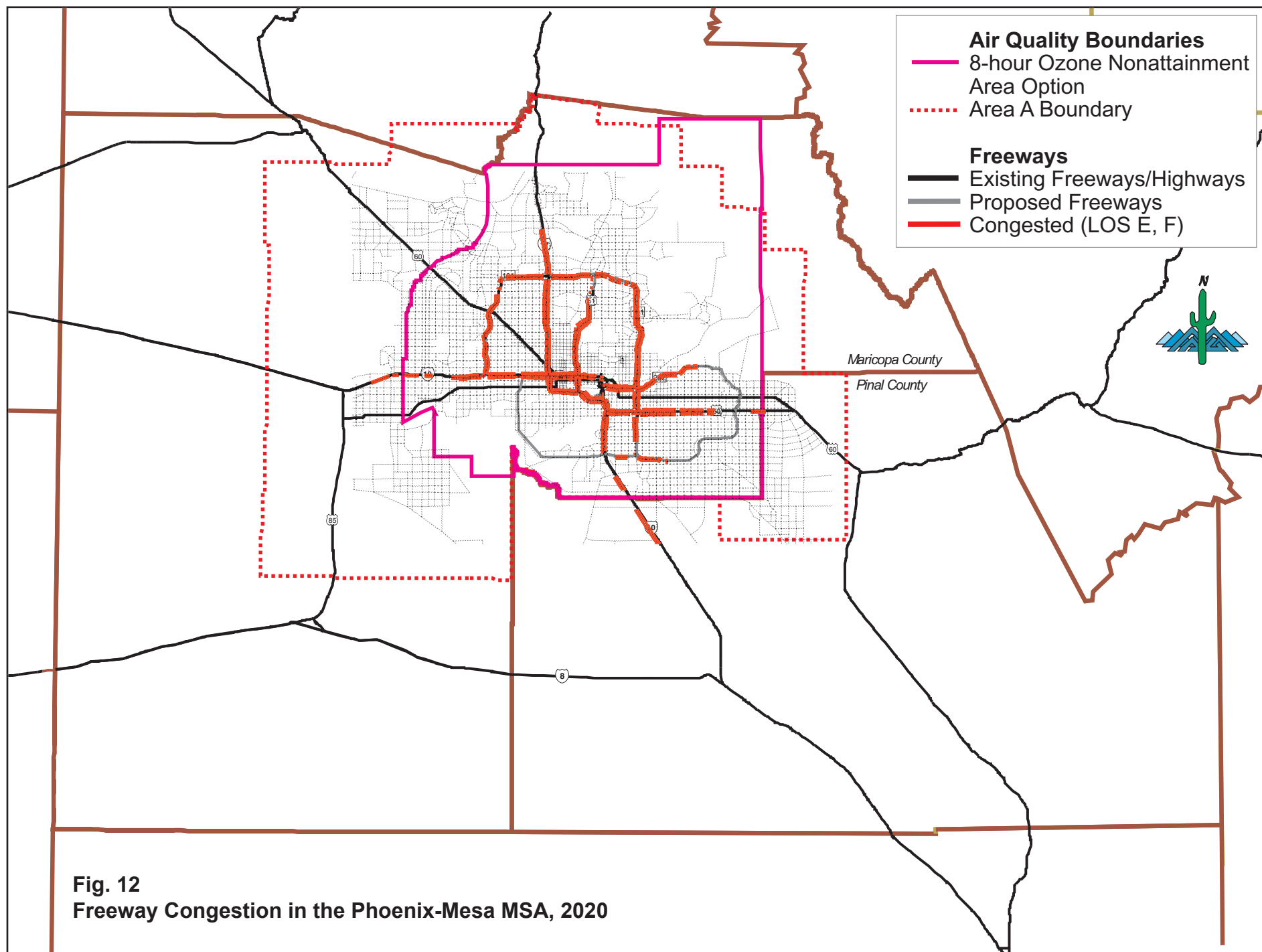
Figure 13 shows typical daily home- to-work commuting patterns that people are expected to exhibit in 2025. During the next twenty years, most of the commuter trips will continue to occur inside the nonattainment boundary option. Most of the commute trips from Pinal County to Maricopa County that are outside the nonattainment boundary option in 2025 are included in Area A and will, therefore, be subject to Area A controls (i.e., inspection/maintenance, clean burning gasoline, Stage II vapor recovery, and employer trip reduction programs). More importantly, by 2025, virtually all of these vehicles will meet the stringent federal Tier 2 tailpipe standards for light duty vehicles and SUVs.

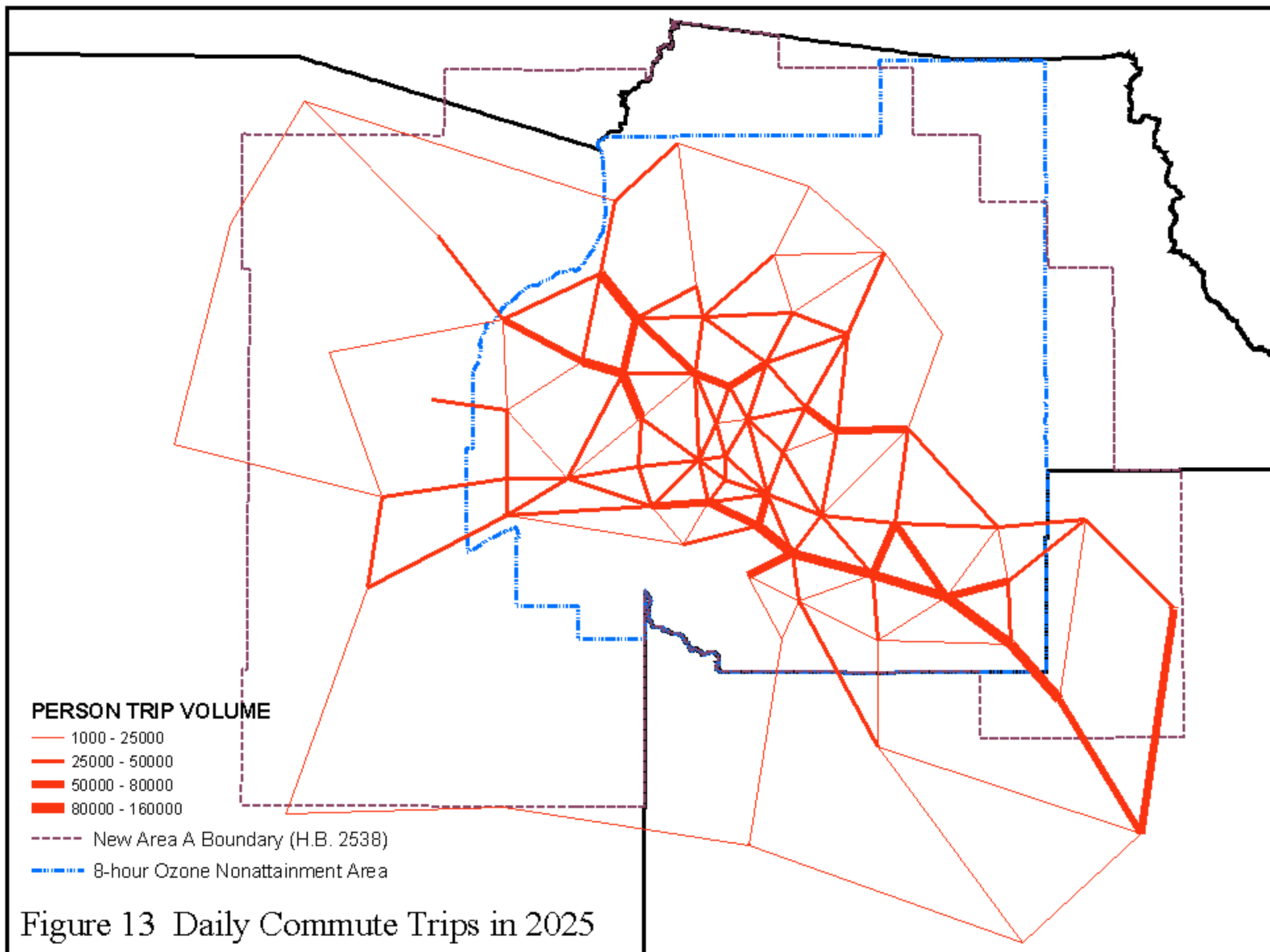
Since future freeway congestion and commute trips will continue to be concentrated within the eight-hour ozone boundary option and Area A, onroad mobile sources outside this boundary will not be significant contributors to eight-hour ozone violations in the MSA. Therefore, expanding the boundary option to cover the MSA would have minimal impact on reducing onroad mobile source emissions.

Meteorology

The climate in the Metropolitan Statistical Area is arid continental, experiencing extreme ranges in daily temperatures. This meteorology is conducive to ozone formation during the months of May through September, when days are typically sunny and daytime temperatures exceed 90 degrees Fahrenheit. These conditions exist uniformly over the MSA. Wind speeds during the summer are frequently less than five miles per hour.

The air flow pattern in the Urban Planning Area is typically drainage flow winds in the early morning, transition in the late morning to early afternoon, and upslope flow in the afternoon. That is, due to the heating and cooling effects of the ground surface, the air flow pattern generally exhibits a morning downslope to afternoon upslope cycle. This typical flow cycle virtually traps the





air pollutants in the valley. Transport of the air pollutants from the valley to the mountain area can happen during the afternoon upslope flow hours, which is normally about three hours before transition starts. After the transition, the air flow is dominated by downslope flow, bringing the pollutants back to the valley again. The wind flow patterns are illustrated in Figure 14. In addition, the blocking effect provided by the mountains in the north and northeast of Phoenix further prevents the air pollutants from being transported away from the valley. Unless further evidence is provided, it can be reasonably concluded that emissions from the metro Phoenix area do not typically travel far enough to cause violations of the 8-hour ozone standard in distant mountainous areas.

Geography and Topography

The eight-hour ozone nonattainment area boundary option is located in the Salt River, Gila River, Agua Fria River, New River and Verde River valleys at an elevation of approximately 330 meters. The area is bordered on the east and northeast by the McDowell, Goldfield and Superstition Mountains and the west and southwest by the Sierra Estrella and White Tank Mountains. As described above, the mountains to the north and northeast of the airshed play an important role in directing the diurnal wind flow patterns shown in Figure 14. The mountains serve as a barrier, inhibiting the transport of ozone pollution out of the valley.

The area of Pinal County adjacent to the boundary option shares similar geographic and topographic characteristics. However, there are fewer mountain ranges in Pinal County, as shown in Figure 1.

Jurisdictional Boundaries

The MSA includes two large Arizona counties, Maricopa and Pinal. The boundaries separating these jurisdictions are identified in Figure 2. Each of these counties has its own air quality division, the Maricopa County Environmental Services Department and the Pinal County Air Quality Control District. These agencies implement, fund, and enforce air quality control measures and programs unique to the conditions and sources within their respective jurisdictions. Pinal County is a largely rural area, with 3.5 percent of the State population, while Maricopa County contains the Phoenix metropolitan area and is home to 60 percent of the State's residents. Since Pinal County represents such a small portion of the State's population and has had no violations of the eight-hour ozone standard, Pinal County has been excluded from the boundary option.

Level of Control of Emission Sources

Table 6 identifies committed control measures which apply to parts of the Metropolitan Statistical Area. In general, these control measures currently apply to the one-hour ozone nonattainment area, Area A, or Maricopa County.

The implementation of committed control measures has been successful in eliminating violations of the one-hour ozone standard in Maricopa County. In coming years, these measures and others mandated within the eight-hour ozone boundary option and Area A will also be effective in attaining the eight-hour ozone standard in the MSA. Many additional measures have been implemented to reduce emissions in Area A. The Arizona Legislature defines the boundaries for Area A and requires

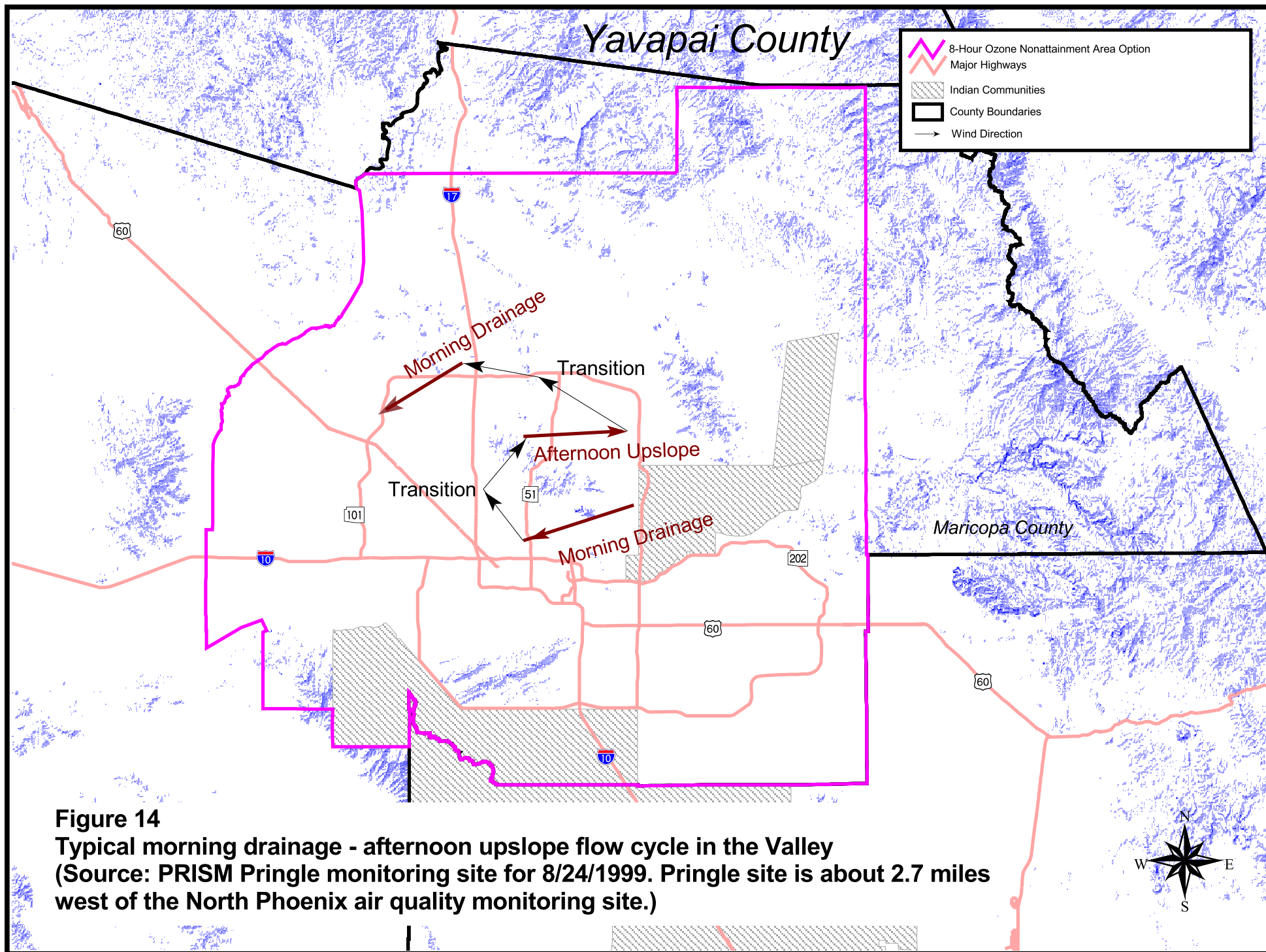


TABLE 6: Serious Area Committed MeasuresArea of Application***PART 1: NEW MEASURES**

| | |
|--|-------------------|
| • Phased-In Emission Test Cutpoints | Area A |
| • Enhanced Emission Testing of Constant Four-Wheel Drive Vehicles | Area A |
| • One-Time Waiver from Vehicle Emissions Test | One-Hour Ozone NA |
| • Increased Waiver Repair Limit Options | Area A |
| • Gross Polluter Option for I/M Program Waivers | One-Hour Ozone NA |
| • Catalytic Converter Replacement Program | Area A |
| • Vehicle Repair Grant Program | Area A |
| • Voluntary Vehicle Repair and Retrofit Program | Area A |
| • Tougher Enforcement of Vehicle Registration and Emissions Test Compliance | Area A |
| • Random Roadside Testing of Diesel Vehicles | One-Hour Ozone NA |
| • Snap Acceleration Test for Heavy-Duty Diesel | Area A |
| • Require Pre-1988 Heavy-Duty Diesel Commercial Vehicles Registered in the Nonattainment Area to Meet 1988 Federal Emissions Standards; Provide Incentives to Encourage Voluntary Accelerated Vehicle Replacement By the Year 2004 | Area A |
| • Long - Term Fuel Reformulation: From and After May 1, 1999 | Area A |
| • Limit Sulfur Content of Diesel Fuel Oil to 500 ppm | Area A |
| • Diesel Fuel Sampling and Reporting | Area A |
| • Alternative Fuel Vehicles for Local Governments, School Districts and Federal Government/Low Emission Vehicle Requirements | Area A |
| • Alternative Fuel Vehicles for State Government/Low Emission Vehicle Requirements | One-Hour Ozone NA |
| • Alternative Fuel Vehicle and Equipment Tax Incentives/Low Emission Vehicle Requirements | One-Hour Ozone NA |
| • Public Awareness Program for Alternative Fuels | One-Hour Ozone NA |
| • National Low Emission Vehicle Program | Area A |
| • Voluntary Gasoline Vehicle Retirement Program/Maricopa County Travel Reduction Program | One-Hour Ozone NA |
| • Oxidation Catalyst for Heavy Duty Diesel Vehicles | One-Hour Ozone NA |
| • Mass Transit Alternatives | One-Hour Ozone NA |
| • Develop Intelligent Transportation Systems | One-Hour Ozone NA |
| • Special Event Controls-Required Implementation from List of Approved Strategies | One-Hour Ozone NA |

TABLE 6: Serious Area Committed MeasuresArea of Application***PART 1: NEW MEASURES**

(Continued)

- | | |
|--|-------------------|
| • Voluntary Lawn Mower Emissions Reduction Program | Area A |
| • Off-Road Vehicle and Engine Standards | One-Hour Ozone NA |
| • Encourage the Use of Temporary Electrical Power Lines Rather than Portable Generators at Construction Sites | One-Hour Ozone NA |
| • Defer Emissions Associated With Governmental Activities | One-Hour Ozone NA |
| • Encourage Limitations on Vehicle Idling | One-Hour Ozone NA |
| • Expansion of Area A Boundaries | Area A |
| • Voluntary No-Drive Days | One-Hour Ozone NA |
| • Analysis of Intersource Credit Trading and Banking Program | One-Hour Ozone NA |
| • Restaurant Charbroiler Controls | Maricopa County |

PART 2: EXISTING MEASURES WHICH ARE BEING STRENGTHENED

- | | |
|--|-------------------|
| • Expansion of Public Transportation Programs | One-Hour Ozone NA |
| • Employer Rideshare Program Incentives | One-Hour Ozone NA |
| • Preferential Parking for Carpools and Vanpools | One-Hour Ozone NA |
| • Coordinate Traffic Signal Systems | Area A |
| • Reduce Traffic Congestion at Major Intersections | One-Hour Ozone NA |
| • Site-Specific Transportation Control Measures | One-Hour Ozone NA |
| • Encouragement of Bicycle Travel | One-Hour Ozone NA |
| • Development of Bicycle Travel Facilities | One-Hour Ozone NA |
| • Alternative Work Schedules | One-Hour Ozone NA |
| • Land Use/Development Alternatives | One-Hour Ozone NA |
| • Encouragement of Pedestrian Travel | One-Hour Ozone NA |
| • Restrictions on the Use of Gasoline-Powered Blowers for Landscaping Maintenance | One-Hour Ozone NA |
| • Alternative Fuels for Fleets | One-Hour Ozone NA |
| • Areawide Public Awareness Programs | One-Hour Ozone NA |

PART 3: ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST

- | | |
|---|-------------------|
| • Encouragement of Vanpooling | One-Hour Ozone NA |
| • Trip Reduction Program | Area A |
| • Park and Ride Lots | One-Hour Ozone NA |
| • Encouragement of Telecommuting, Teleworking and Teleconferencing | One-Hour Ozone NA |

TABLE 6: Serious Area Committed MeasuresArea of Application***PART 3: ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST**

(Continued)

- Promotion of High Occupancy Vehicle Lanes and By-Pass Ramps One-Hour Ozone NA

PART 4: ADDITIONAL COMMITMENTS FOR MEASURES (OZONE ONLY)

- Improved Rule Effectiveness, Area Sources One-Hour Ozone NA
- State Procurement Code-Request for Low or No Volatile Organic Compound Products One-Hour Ozone NA
- Improved Stage II Effectiveness Area A
- Municipal Solid Waste Landfills Rule 321 One-Hour Ozone NA
- Solvent Cleaning Operations Rule 331 One-Hour Ozone NA
- Petroleum Solvent Dry Cleaning Rule 333 One-Hour Ozone NA
- Rubber Sport Ball Manufacturing Rule 334 One-Hour Ozone NA
- Architectural Coatings Rule 335 One-Hour Ozone NA
- Aerospace Surface Coating Rule 336 One-Hour Ozone NA
- Graphic Arts Rule 337 One-Hour Ozone NA
- Semiconductor Manufacturing Rule 338 One-Hour Ozone NA
- Vegetable Extraction Processes Rule 339 One-Hour Ozone NA
- Cutback and Emulsified Asphalt Rule 340 One-Hour Ozone NA
- Metal Investment Casting Rule 341 One-Hour Ozone NA
- Wood Coating Rules 342 and 346 One-Hour Ozone NA
- Commercial Bread Bakeries Rule 343 One-Hour Ozone NA
- Windshield Washer Fluid Rule 344 One-Hour Ozone NA
- Automobile Refinish Coatings Rule 345 One-Hour Ozone NA
- Ferrous Sand Casting Rule 347 One-Hour Ozone NA
- Aerospace Manufacturing and Rework Operations Rule 348 One-Hour Ozone NA
- Pharmaceutical, Cosmetic, and Vitamin Manufacturing Operations Rule 349 One-Hour Ozone NA
- Storage of Organic Liquids at Bulk Plants and Terminals Rule 350 One-Hour Ozone NA
- Loading of Organic Liquids Rule 351 One-Hour Ozone NA

*Area A (see Figure 2)

Maricopa County (see Figure 1)

One-Hour Ozone NA = One-Hour Ozone Nonattainment Area (see Figure 1)

various air quality measures to be implemented within the Area A boundary. Area A was originally equivalent in size to the one-hour ozone nonattainment area. As a result of S.B. 1427 and H.B. 2538, Area A was expanded to encompass a larger portion of central Maricopa County (see Figure 2). The expanded Area A encompasses areas adjacent to the eight-hour ozone nonattainment area option where there is the greatest likelihood of population and employment growth over the next twenty years. Control measures applied to sources in Area A establish a “safety margin” for ozone precursor emissions. As has been done in the past, the Arizona Legislature could implement new measures and/or expand Area A to accomplish additional air quality improvements if necessary. Since Area A controls already apply to sources adjacent to the eight-hour ozone boundary option, expansion of the eight-hour boundary option would have a minimal marginal effect on reducing emissions in the MSA.

It is important to note that mobile source control measures such as vehicle emissions inspection and maintenance (enhanced I/M) and clean burning gasoline (CARB Phase 2 or Federal Phase II RFG) are being applied throughout Area A. Therefore, most vehicles driven in the eight-hour ozone nonattainment area boundary option are already controlled by enhanced I/M and Phase II reformulated fuels, which reduces their potential contribution to eight-hour ozone violations. It is estimated that expanding the eight-hour ozone boundary option to the entire MSA would increase the number of vehicles covered by the I/M and clean burning gasoline programs by less than five percent.

Regional Emission Reductions

Tables 2 and 3 illustrate the reductions in VOC and NO_x emissions which will occur between 1999 and 2015. Note that the onroad mobile source emissions of ozone precursors are projected to decline by at least 55 percent. This reduction will occur at the same time regional vehicle travel grows by 65 percent. These reductions will result in maintenance of the one-hour ozone standard at all monitors in the MSA through 2015.

Emission reductions will continue to occur in the MSA due to implementation of local control measures in Table 6, as well as federal initiatives, such as stricter Tier 2 light duty vehicle and heavy duty vehicle standards and low-sulfur fuel requirements. EPA guidance issued June 2, 2003 indicates that the federally-mandated Tier 2 and heavy duty vehicle controls may be sufficient to allow nonattainment areas like Maricopa County that are within .005 ppm of the standard to meet this standard without implementing additional controls. In addition, EPA has proposed a comprehensive national program which may provide additional reductions in emissions from nonroad diesel engines and fuels.

The control measures in Table 6 are legally enforceable commitments submitted to EPA as part of the Revised MAG 1999 Serious Area Carbon Monoxide Plan for the Maricopa County Nonattainment Area and the Revised MAG 1999 Serious Area Particulate Plan for PM-10 for the Maricopa County Nonattainment Area. Control measures in these plans apply to areas that are at least as large as the one-hour ozone nonattainment area boundary (see Figure 1). As Table 5 indicates, these controls have also been effective in reducing eight-hour ozone concentrations at monitors throughout the MSA.

CONCLUSION

EPA allows States to recommend nonattainment area boundaries smaller than the MSA boundary. An analysis has been conducted to address how each of the factors identified by EPA affect the determination of the boundaries. The analysis indicates that the boundary option shown in Figure 1 is more appropriate than the Metropolitan Statistical Area as the eight-hour ozone nonattainment area. The key conclusions are as follows:

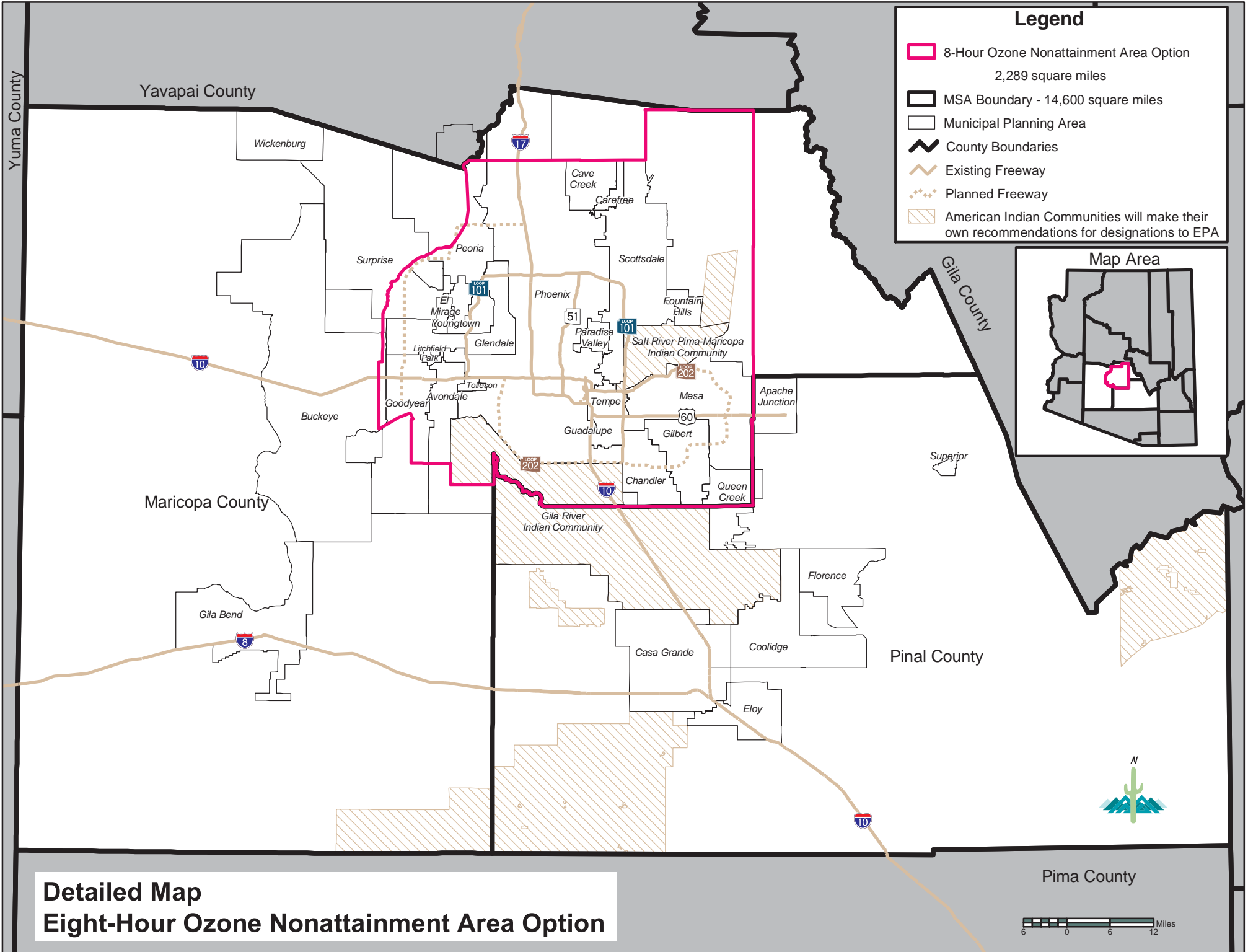
- **Expected Growth** - More than 6 million people and nearly 3 million jobs are expected to be located inside the Phoenix-Mesa Metropolitan Statistical Area (MSA) by 2020. Between 2000 and 2020, 65 percent of the population growth and 81 percent of the employment growth in the MSA will occur inside the proposed boundary option. (See Table 1). The expected growth in population and employment does not equate to future increases in emissions or ozone concentrations. In fact, past trends and future projections indicate that ozone precursor emissions will continue to decline, in spite of rapid growth in the area, due to local controls already in place in Area A and stricter federally-mandated standards for vehicles and fuels that will go into effect beginning next year.
- **Air Quality** - Violations of the eight-hour standard occurred at only three out of nineteen monitors in the MSA, based on 2000-2002 data. (See Figure 2). These three monitors, located in north central and northeastern Maricopa County, recorded violations only slightly higher than the standard (.085 ppm). The three ozone monitors in Pinal County have not violated the eight-hour standard.
- **Emissions** - At least 93 percent of the volatile organic compounds (VOC) and 85 percent of the nitrogen oxides (NOx) produced by humans will remain within the boundary option through 2015. (See Figures 3-6).
- **Population Density and Degree of Urbanization** - More than three-quarters of the densest residential areas and 94 percent of the highest employment areas in the Metropolitan Statistical Area will remain inside the boundary option by 2020. (See Figures 7 and 9).
- **Monitoring Data in Local and Larger Areas** - Only three monitors in the Phoenix-Mesa MSA violated the eight-hour ozone standard based on the most recent three years of data (2000-2002). The violations recorded by these monitors are only .001 ppm above the standard (at .085 ppm). All three of the violating monitors are located inside the boundary option. Rural monitors outside the boundary that have readings approaching the standard are located at least thirty miles from the Urban Planning Area and may be influenced by other sources such as biogenics.
- **Location of Emission Sources** - At least 85 percent of the anthropogenic emissions and most of the major point sources will continue to be located inside the boundary option through 2015. By 2015, some new power plants will locate outside the boundary option in western Maricopa County. (See Figures 3-6 and Figures 10-11).
- **Traffic and Commuting Patterns** - Traffic forecasts based on the latest socioeconomic projections show that most of the future freeway congestion and commute trips will continue to take place inside the boundary option. (See Figures 12 and 13).
- **Meteorology, Geography and Topography** - The wind flow patterns in the Valley play a significant role in the formation and movement of ozone pollution. (See Figure 14). The mountains to the north and east of the urban area serve as a natural barrier that inhibits transport of emissions away from the Valley.

- **Jurisdictional Boundaries** - Pinal County has not had violations of the eight-hour ozone standard and does not contribute to violations in Maricopa County, and therefore, should not be included in the nonattainment boundary.
- **Level of Control of Emission Sources** - Control measures applied in the one-hour ozone nonattainment area, Maricopa County, and Area A have been successful in eliminating exceedances of the one-hour ozone standard in the MSA since 1996. Existing controls and other measures which may be mandated within the boundary option and Area A will be effective in eliminating eight-hour ozone violations throughout the MSA. EPA has adopted stricter Tier 2 light duty vehicle and heavy duty vehicle controls and low sulfur fuels which will significantly reduce vehicle emissions in the near future. EPA guidance issued June 2, 2003 indicates that these federal measures alone may be sufficient to achieve attainment of the eight-hour standard by 2007 in areas with ozone concentrations close to the level of the standard (e.g. .005), such as the Phoenix-Mesa Metropolitan Statistical Area.
- **Regional Emission Reductions** - Modeling for the one-hour ozone nonattainment area in Maricopa County shows that onroad mobile source emissions of VOCs and NOx will be reduced by more than 55 percent between 1999 and 2015, at the same time vehicle travel is projected to increase by 65 percent. (See Tables 2 and 3). These reductions will occur as a result of the local control measures in Table 6, as well as stricter federal standards for light duty vehicles, heavy duty vehicles and engines, and low sulfur fuels. EPA guidance issued June 2, 2003 indicates that areas such as Maricopa County that are close to the eight-hour ozone standard are likely to attain the standard by 2007 due to federally-mandated vehicle and fuel controls alone.
- **Consistency with the Clean Air Act** - The eight-hour ozone boundary option is consistent with the definition of nonattainment in the Clean Air Act, Section 107(d)(1), because it includes the three monitors that did not meet the eight-hour ozone standard based on the three years of most recent monitoring data (2000-2002). Anthropogenic sources inside the boundary option contribute to the eight-hour violations in northeastern Maricopa County. Conversely, emission sources in these downwind areas are insignificant and do not contribute to violations in the upwind urban area.

The nonattainment boundary option shown in Figure 1 will be effective in reducing anthropogenic emissions that cause violations of the eight-hour ozone standard. Attainment of this new standard may be required in the Maricopa County area as early as 2007. Reductions in VOC and NOx emissions within the boundary option will result in attainment and maintenance of the eight-hour ozone standard at all monitors in the MSA, including the rural areas of Humboldt Mountain and Blue Point. To the extent that the ozone is being transported away from the Phoenix-Mesa MSA, reductions in emissions inside the boundary option will also reduce ozone concentrations at distant, downwind locations such as those monitored in the Tonto National Forest (30 miles away) and Hillside Ranger Station (58 miles away). This will ensure that wilderness areas, as well as people, are protected from the harmful effects of ozone pollution.

APPENDIX

DETAILED MAP OF THE EIGHT-HOUR OZONE NONATTAINMENT AREA OPTION AND LEGAL DESCRIPTION



Legal Definition of the Eight-Hour Ozone Nonattainment Area Option

The Eight-Hour Ozone Nonattainment Area Option is bounded as follows:

Commencing at a point which is at the intersection of the easterly line of Range 7 East, Gila and Salt River Baseline and Meridian, and the southern line of Township 2 South, said point is the southeastern corner of the Eight-Hour Ozone Nonattainment Area Option, which is the point of beginning;

Thence, proceed northerly along the eastern line of Range 7 East to a point where the eastern line of Range 7 East intersects the northern line of Section 36 of Township 8 North, Range 7 East, said point is also the Maricopa-Yavapai County line;

Thence, westerly to the western line of Section 34 of Township 8 North, Range 5 East;

Thence, southerly to the northern line of Section 4 of Township 6 North, Range 5 East;

Thence, westerly along the northern line of Township 6 North to a point of intersection with the Maricopa-Yavapai County line, which is generally described in A.R.S. § 11-109 as the center line of the Agua Fria River (Also the north end of Lake Pleasant);

Thence, southwesterly and southerly along the Maricopa-Yavapai County line to a point which is described by A.R.S. § 11-109 as being on the center line of the Agua Fria River, two miles southerly and below the mouth of Humbug Creek;

Thence, southerly along the center line of the Agua Fria River to the intersection of the center line of the Agua Fria River and the center line of the Beardsley Canal, said point is generally in the northeast quarter of Section 17, Township 5 North, Range 1 East, as shown on the U.S. Geological Survey's Baldy Mountain, Arizona Quadrangle Map, 7.5 Minute Series (Topographic), dated 1964;

Thence, southwesterly and southerly along the center line of Beardsley Canal to a point which the center line of the Beardsley Canal intersects with the center line of Indian School Road;

Thence, westerly along the center line of west Indian School Road to a point where the center line of west Indian School Road intersects with the center line of North Jackrabbit Trail;

Thence, southerly along the center line of Jackrabbit Trail approximately nine and three-quarter miles to a point where the center line of Jackrabbit Trail intersects with the Gila River, said point is generally on the north-south quarter section line of Section 8, Township 1 South, Range 2 West;

Thence, northeasterly and easterly up the Gila River to a point where the Gila River intersects with the northerly extension of the western boundary of Estrella Mountain Regional Park, which point is generally the quarter corner on the northern line of Section 31, Township 1 North, Range 1 West;

Thence, southerly along the extension of the western boundary and along the western boundary of Estrella Mountain Regional Park to a point where the southerly extension of the western boundary of Estrella Mountain Regional Park intersects with the southern line of Township 1 South;

Thence, easterly along the southern line of Township 1 South to a point where the south line of Township 1 South intersects with the western line of Range 1 East, which line is generally the southern boundary of Estrella Mountain Regional Park;

Thence, southerly along the western line of Range 1 East to the southwest corner of Section 18, Township 2 South, Range 1 East, said line is the western boundary of the Gila River Indian Reservation;

Thence, easterly along the southern boundary of the Gila River Indian Reservation, which is the southern line of Sections 13, 14, 15, 16, 17 and 18, Township 2 South, Range 1 East, to the boundary between Maricopa and Pinal Counties as described in A.R.S. § 11-109 and 11-113, which is the eastern line of Range 1 East;

Thence, northerly along the eastern boundary of Range 1 East, which is the common boundary between Maricopa and Pinal Counties, to a point where the eastern line of Range 1 East intersects the Gila River;

Thence, southerly up the Gila River to a point where the Gila River intersects with the southern line of Township 2 South;

Thence, easterly along the southern line of Township 2 South to the point of beginning which is a point where the southern line of Township 2 South intersects with the easterly line of Range 7 East.